NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

INTRANET FOR THE SYSTEMS MANAGEMENT DEPARTMENT

by

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and

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September, 1997

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The objective of this thesis is to describe in detail the reasoning and development of an Intranet based decision support system. This thesis is intended to show how World Wide Web technologies can be used to develop a prototype Intranet that can provide access to information for faculty, students and staff members via a World Wide Web browser. It provides more open communication in the Department of Systems Management, quicker and more consistent information flows (service) to the faculty and staff, and reduced time spent on the handling of repetitive and often simple information exchanges. The decision support function is supported by a database which is an information clearinghouse, providing all personnel with 24-hour access. Personnel are empowered by information availability and are likely to be more proactive. A prototype has been developed to demonstrate the concept and to demonstrate the validity of rapid prototyping as a means of validating the effectiveness of the modified Intranet development methodology. The prototype is located at [http://131.120.41.236].

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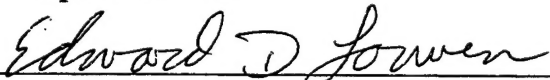B.S. Texas Tech University, 1983

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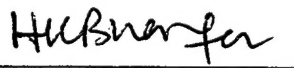### September 1997

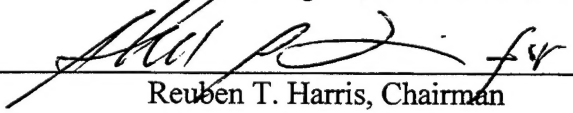Author: _____
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ABSTRACT

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I. INTRODUCTION

A. BACKGROUND

Because of their low cost relative to client server and mainframe applications, Intranets have gained popularity in business operations worldwide. Additional factors that have supported the increased popularity are their ease of use and the ability to rapidly deploy information and applications enterprise wide.

Intranets developed out of the popularity of the Internet and the World Wide Web[1] (WWW). The Internet was developed by the Defense Advanced Research Projects Agency (DARPA) and the National Science Foundation (NSF) as a means to connect national command and control computers and networks in a manner that would survive nuclear attack directed against the United States. The World Wide Web is just an extension of the Global Internet.

B. THE INTERNET

The entire Internet is global and involves many different protocols and communications schemes. The World Wide Web (WWW) is a subset of the Internet that has experienced explosive growth since 1990. WWW technology is centered on the Transmission Control Protocol/Internet Protocol (TCP/IP). Use of TCP/IP and browser software allows users to have a graphical interface to other computers and networks also using TCP/IP and WWW based servers.

The ease of use, which is the primary reason for the popularity of the WWW, is supported primarily by the intuitive nature of the graphical interface. The interface is

known as hypertext[2]. The concept of hypertext involves attaching links to selected words or images to point to related information. Users can select highlighted words, phrases or images and quickly navigate to related WWW sites or related information elsewhere in that file or resource.

C. INTRANETS

There are many definitions of Intranets. Some researchers define Intranets as containing some form of proprietary or enterprise specific applications and communications protocols. Others use a more broad definition, "a non-public website devoted to one company and for one company".[3]

Basically an Intranet is a collection of technologies that are common to the Internet to publish and share information within an organization amongst organization employees rather than sharing or providing information to the general public. Developing and deploying Internet technologies that use the previously discussed hypertext WWW tools for internal publishing solves both technical issues and practical problems of information currency and availability.[4]

In order to have value the Intranet needs to support some organizational function. Since Intranets are "non-public" the value is not derived from revenue generation but from supporting management or business functions. Possible business functions are;

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[1] Rizzo, John, "Intranet 101", Bay Area Computer Currents, February 4 1997, pp45-58
[2] Levitt, Lee, "Intranets: Internet Technologies Deployed Behind the Firewall for Corporate Productivity", prepared for Internet Society INET'96 Annual Meeting
[3] According to Adam Kuhn, of Edison Electric Institute, quoted in "Finding the right Intranet Technologies to buy", Strom, David, 6/10/96, http://www.strom.com/pubwork/intranet.html
[4] http://www.zdnet.com/intweek/print/951113/webguide/doc1.html

decision making, information sharing, information gathering, policy and news publishing and group collaboration. Because Intranets are not revenue generators, managers must understand the associated benefits and limitations of Intranets.

1. Benefits of Intranets

There are several main benefits that Internet technologies bring to organizations. These include the ease of sharing information between connected computers, the ability to develop applications that support the prevalence of heterogeneous (varying operating systems and hardware architectures) computers throughout organizations, common user application interfaces, and e-mail and browsers[5]. The attractiveness of Intranets over groupware, client-server applications, and proprietary applications is that Intranets can accomplish these functions at a lower cost.

Rapid prototyping, ease of setup, scalability, and availability of tools are the key features that make Intranets economical and attractive to organizations. These four characteristics combine to enable the services and protocols that are used to build and deploy the Intranet system, which in turn supports the functions of the organization.

Using the enterprise Intranet as a means for information sharing can have some cost savings and therefore some monetary value to an organization. Navigation through hypertext links and information retrieval is relatively simple, which will keep training costs down.[6] Internet and Intranet information publishing is accomplished with HTML pages that are generally restricted to presenting static information. New tools and

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[5] Levitt, Lee, "Intranets: Internet Technologies Deployed Behind the Firewall for Corporate Productivity", prepared for Internet Society INET'96 Annual Meeting
[6] Ibid

techniques are making dynamic publishing possible. (The information in this prototype is not restricted to static text or graphics.)

As stated cost savings can account for some monetary benefit of an Intranet. Publishing dynamic information via the Intranet allows information to be shared through automated presentation of routine reports and messages, and decreased decision timelines through access to current, dynamically updated information. Intranet based information sharing also will decrease expenditures for the raw materials (for example, paper and copier toner) for traditional printed distribution. Additional savings will be seen in labor and maintenance costs. Fewer paper copies will be needed, resulting in lower copier usage, so copier maintenance costs will decrease. Finally, clerical personnel will not be required to make and distribute multiple copies.[7]

Some additional benefits of Intranets include things like marketing value and the opportunity to forge new business relationships with customers, such as the ability to attract quality candidates, and the opportunity to create a sense of community.[8]

In the context of the Prototype developed for this thesis and the purpose of this research, one of the primary values of Intranets is the way in which Intranets support information sharing. The information sharing can be in many forms. Information can be published to a central site for all personnel to view, similar to bulletin boards. Information can be stored in databases for retrieval as needed by users. Intranets can be used to collect information from throughout the organization for use by a centralized or

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[7] Currid, Cheryl, "Quit Stalling and Start an Intranet", Windows Magazine, p.49, April 1997
[8] Slater, Derek, WebMaster Magazine, CIO Publications Inc - April 1997

traditional application. And finally Intranets can gather information and allow users to have dynamic access to the information from any location on the enterprise network.

2. Limitations

The key limitations of Intranets are how cost and benefit are assigned to the Intranet development and support. Assigning a value to the function of information sharing is difficult. Intranets do not make this value determination any easier. Managers are still faced with answering the question of "what is the information worth to me, and how much am I willing to pay to get the information?" Intranets also add the question of "how does this use of technology allow me to make better decisions or make decisions better?"

Cost savings and traditional return on investment (ROI) calculations are risky. The very nature of the Intranet being internal and not contributing to revenue generation is obvious. Skeptics will also point out that the cost savings for paper and toner will be negligible and users will probably print out and store or discard as much as was previously distributed. There are many drawbacks of traditional ROI thinking. "There's something about that reach and the value Intranets create that just isn't captured by traditional ways of looking at ROI."[9]

Critics of Intranets also point out that one impact of relying on automated information exchange versus more traditional paper methods is the lack of personal face to face interaction of workers. To minimize the risk to interaction, Intranets should be used to alleviate some of the information bottlenecks, increase information availability, and reduce information search times within organizations so that workers time can be

spent making decisions and increase the actual amount of time available for work and interaction.

There are also some technological limitations of Intranets. Due to the nature of HTML publishing many complex queries cannot be handled which requires that developers break the problem into sequential steps. This means that the developers must conduct a thorough analysis of the process or system being automated. Care must also be exercised when developing the interface so that the users are provided appropriate feedback and that information retrieval is as efficient as possible.

D. DECISION SUPPORT SYSTEMS

DSS are systems developed to assist managers with decision problems. DSS vary in the way they perform. Some DSS function by using mathematical modeling, others perform simulations and others facilitate negotiation and collaboration. Sophisticated DSS perform combinations of these functions.

DSS which support mathematical modeling, help the manage/user develop an optimal or best solution. These models can offer the user either a range of acceptable solutions, where one optimal solution cannot be efficiently determined or the tools can be used for modeling to show the user the consequences of management decisions.

DSS which support simulations, allow the decision-maker to run scenarios to test the impact of changes in different variables on the independent decision variable. The benefit of simulation DSS is that they allow the user to compress time or run multiple simulations at low cost.

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[9] Slater, Derek, WebMaster Magazine, CIO Publications Inc.- April 1997

No matter the function, the DSS can be of many types. There are stand alone DSS that support a single user, network DSS that support multiple users making individual decisions, and group DSS that are designed specifically to support collaboration and the dynamics of groups.

For the purpose of this research DSS are defined in a much broader manner. DSS are defined as any tool that supports the user in formulating or making management decisions. This broad definition includes the mathematical processes of decision optimization and, for the Intranet Prototype, includes decision support functions such as information sharing, information retrieval and group collaboration.

Traditional decision making often results in a sub-optimal solution, usually because the decision did not have the time to search for all the relevant information or the cost of keeping all the information available for immediate use has been prohibitive. Allowing the decision-maker access to enterprise, or even global, information resources in a timely and efficient manner will allow the decision-maker to make a more informed and therefore better decision.

E. DECISION SUPPORT USING THE WWW

There are many examples of Internet based DSS's. Some examples of Internet based decision can be found at http://dnet.as.nps.navy.mil (DecisionNet), http://www.mcs.anl.gov (NEOS), http://www.olsonresearch.com (Olson Research

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Associates, and http://weber.u.washington.edu/~cvj/tsp/tspnew.html (Sensitivity Analysis for the Euclidean Traveling Salesman Problem).[10]

DecisionNet is a particularly applicable location because the DecisionNet is a Project that is "a distributed collection of decision technologies that are accessible and executable over the World Wide Web"[11]

The NEOS (Network Enabled Optimization System) is a site that allows users to access computational resources remotely. Olson Research Associates is a consulting firm that specializes in financial depository institutions.

The concept that any computer can retrieve information with a WWW browser is known as platform independence. If the access permissions are set to allow access, faculty members will have access to the same information while traveling, at home or down the hall, that they have while at their own desk. Platform independence includes the concept of multiple hardware designs and architectures. (For example, Apple Macintosh, Unix and Intel based personal computers and workstations.) All of these machines have equal access to the Intranet.

Platform independence also allows development of applications for use enterprise wide without having to develop versions to support multiple operating systems and hardware architectures. Through the Open Database Connectivity (ODBC) protocol and a Web server, applications can be developed to run on the server and accessed by all users through each individual's preferred WWW browser on remote client workstations.

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[10] Bhargava, Hemant K., et al., "Decision support on demand: Emerging electronic markets for decision technologies", *Decision Support Systems, The International Journal*, vol. 19, no. 3, pp. 193-214.

[11] http://dnet.as.nps.navy.mil

Training costs are also kept lower with platform independence. Users only need to learn how to use a WWW browser and the few specific actions that a button may perform on a particular web page. The printing, saving and sending of information is all handled through the combination of the WWW browser on the client machine and Webserver located on the server.

Access can be limited to the local or a specific set of IP addresses while still maintaining a connection to the Internet through the same LAN. This access restriction is a function of the Intranet server software and does not require any additional hardware or overhead. Limiting access to a specific range of IP addresses will not effect Internet access or Intranet access in any way other than prohibiting access to unauthorized users.

An additional measure of security can be implemented to further segment how information access is granted. Since all access is made through preformatted queries contained in HTML pages that are stored on the Intranet Server, new queries cannot be introduced to the system without the approval of the administrator. This characteristic also allows access to the various queries and pages to be segmented by the directory file system. This access control is accomplished by assigning user names and passwords for system access, and further restricting access to pages to individuals or groups/types of users.

Security is important to insure that your information is safeguarded from change, loss or destruction so that the value of the information is not lost. When considering security and access the user must define how he or she wants to segment or allow access to different parts of the information database.

When increasing the availability, security must be considered to prevent open access to information.[12] The Intranet security can be set to allow access from a very narrow range of IP (Internet protocol – the logical address of a particular computer in a network) addresses on a local area network (LAN), to literally unlimited worldwide access via the Internet.

Additionally, one can search the Internet Sites of the many vendors of Internet Tools for examples of their products. One such site is http://www.allaire.com. This site is run by the developers of the Cold Fusion Database Tools used by the Authors for their prototype.

Although many organizations have developed Intranets and DSS on those Intranets, there are not many public examples. By the very nature of the Intranet being internal to an organization and supporting internal functions, Intranets are not open to public investigation or browsing. Many of the Intranets were developed to gain some form of competitive advantage and are therefore highly secured.

One interesting link from this site is http://www.collegeselect.com/. This site is typical of the capabilities of database supported Internet DSS. The decision problem for this site is the selection of a college or university based on multiple attributes. The concept behind this site is to help a user select a college or university from all the colleges and universities in the United States without the user having to search through numerous publications, advertisements and other sources. The developers of this site present the user with a means of selecting preferences for many of the attributes associated with a college or university. The underlying heuristic or algorithm compares

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[12] Troy Troxler, Epoch Networks, Byte, v. 22, no. 5, pp. 88b, April 1997

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all of these attributes with information stored in a database to present the user with a list of colleges and universities that match their criteria. The final step of making the decision is left to the user. In some cases the query will return only one solution. In this case the decision is to either accept or reject the recommendation.

F. PURPOSE OF RESEARCH

The purpose of this thesis is to explore the capabilities and limitations of Intranet decision support systems (DSS). The research involves the development of a prototype for the administration of the Department of Systems Management at the Naval Postgraduate School (NPS). The prototype will explore the applicability and suitability of current technology in the area of World Wide Web (WWW) browser based database access to support the development of an Intranet based Decision Support System. Key considerations will include the following: ease of learning and training the user to use the browser interface, security, functionality, and scalability. The prototype is based on commercial off the shelf (COTS) software products combined with custom designed HTML pages to automate specific department processes.

G. METHOD

The intended users of this Intranet are the Faculty and administrative support technicians in a curricular department.

The authors used a modification of an Intranet Development Methodology (IDM) developed by Information Age, Inc. The IDM consists of nine basic steps; Web site study, determination of customer requirements, systems analysis and design, determination of system architecture, implementation of the plan, system testing, iterative

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development of content and interface, formalization of procedures and documentation, and finally training. As mentioned earlier, the IDM is discussed in detail in Chapter II.

H. SCOPE OF RESEARCH

The scope of this thesis is to conduct an analysis of the Department of Systems Management at the Naval Postgraduate School to determine the suitability of various administrative functions for automation and for the development of an Intranet based DSS. The processes included in the prototype were chosen as a result of the analysis of the number of users affected and the rate at which information is updated. Those processes that involve many users and/or involve data that frequently changes were selected as having high impact on the department. The expected outcome of the research is that these processes will benefit most from automation and subsequent information sharing via an Intranet.

I. DESCRIPTION OF THE PROTOTYPE

The prototype functions through the combination of two software packages, a Webserver and an ODBC server. High performance hardware is not a requirement for any of this software to function. Higher performance hardware will yield overall higher server performance. This prototype runs, without special action or intervention, on standard desktop personal computers. The primary server platform is a Pentium 166 MHz machine, with 128 MB RAM and a single 10BaseT-ethernet connection to the LAN. This Intranet Webserver is not the same machine as the network server. In fact, the prototype will run on a peer network. The only network requirement is that TCP/IP be installed as one of the network protocols.

In addition to this platform, the prototype has been tested on both a 486 class (20 MB RAM, 80 MHz) machine and a 133MHZ Pentium (32MB RAM) machine. The authors conducted a test to evaluate the perceived performance benefit of different server platforms. The test involved running a query to retrieve an E-mail address from the database based on a search of Lastnames. There was a noticeable difference noted in the speed in which queries were answered between the 486 and either of the Pentium machines. The test took over 1 minute when the 486 CPU machine was the server. The same query took less than 2 seconds on the Pentium based server. In order to have identical network conditions (traffic, bandwidth, and noise) the query was run simultaneously from separate clients on the same network.

Both the ODBC server and the Webserver handle security for the Intranet. The Webserver is concerned with the authentication of the user and access rights to the HTML and Database Markup Language (DBML) pages and directories. DBML pages contain codes and commands, similar in form to HTML, that are interpreted by the ODBC server. The ODBC server handles any rights, permissions and passwords for access needed to the actual database. The ODBC server, through the ODBC protocol, handles concurrent access and record locking that may be necessary to handle simultaneous access by more than one user.

HTML and DBML pages were created that link to a database of departmental information. The pages are the interface to provide a preformatted consistent information to information that is used in the department. Processes and information were selected that would be most beneficial through an Intranet system.

Processes were selected on the basis of the number of users and how frequently they access a particular piece or collection of information, versus the amount of time and effort required for maintaining the information. For example, information that is not often accessed and is used by one user was determined to not benefit from Intranet publication. Information that is accessed by many users frequently is a prime candidate for publication via an Intranet.

Information contained in the database includes instructor specific information (such as e-mail address and phone number), class information (description, quarter and year, projected enrollment), textbook requisition (class, quantity), and student observation forms (SOF).

J. EXPECTED BENEFITS OF RESEARCH

This research will result in a design and development methodology for the Department of Systems Management at the Naval Postgraduate School. The Intranet Design Methodology explained in Chapter II can be applied to any organization considering development of an Intranet.

A second benefit of this research will be a prototype for selected administrative processes for the Department of Systems Management. This prototype will be used to demonstrate the ease of implementation and the capabilities that an Intranet can provide.

A third benefit is that in addition to testing and demonstrating the ability to rapidly develop applications, the prototype will function as a model for other department level Intranets at the Naval Postgraduate School. A preliminary demonstration of the prototype to selected department faculty and administrators generated a lot of interest

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regarding the value and benefit of such a tool for the department and the Naval Postgraduate School.

K. THESIS ORGANIZATION

Chapter I is an introduction. It includes the purpose of this thesis with details on broad benefits of basing DSS' on the WWW, discussion of technologies that support Intranet development, and an outline of the remainder of thesis. Chapter II details the Intranet Development Methodology. Chapter III is a description of the department process analysis, detailing how the system was defined, including a description of the current system, customer requirements, systems analysis and design, and the system architecture. Chapter IV describes the Intranet design. Chapter V lists implementation issues. Chapter VI is a summary with conclusions and recommended areas for future research. There are also four appendices. Appendix A is the process data flow diagrams. Appendix B is copies of department forms and reports. Appendix C is a user's manual. Appendix D is an administrator's manual. Appendix E is a data dictionary.

II. INTRANET DEVELOPMENT METHODOLOGY

A. CHOICE OF THE SYSTEM

The Department of Systems Management was chosen as a candidate for an Intranet system, because of the limited functionality of the existing computer-based information system for supporting business processes conducted on a weekly, quarter, and yearly basis for the department. Although connected to the university on a LAN based system, the information system is minimal. In general, the department was familiar with some of the benefits of an Intranet system and therefore was receptive to the idea of migrating their daily processes to a more automated means. This is an in-depth study of the entire system in detail to understand the existing information flows and to identify opportunities for improvement best suited for the academic environment.

1. Goal of the Intranet System

The goal in developing this system is to automate and streamline those highly used, primary processes used by the Department of Systems Management through a web based system. By applying state-of-the-art technologies in Intranet development, a tool will be developed for use by the administration, faculty and students, which will reduce time and save money, with marked benefits in amplifying individual efficiency and productivity.

2. Development Process

To determine the department's needs, a top-down design method was used. The flexibility of the top-down design method permits breaking the large picture into smaller

parts or subsystems[13]. The resulting hierarchical modular structure allows visualization of the synergy between the interfaces of the subsystems.

The important advantages of the top-down approach are that it avoids chaos in designing a system all at once, allows the designers to work in parallel on different, but necessary subsystems, and the simplicity involved prevents the designers from getting so mired in detail that they loose site of what the system is really supposed to attain[14].

The specific top-down technique chosen is a modification of the Intranet Development Methodology (IDM) [15] developed by Information Age, Inc., a website and software development company. The technique is very similar to the systems development life cycle developed by Kendall and Kendall[16]. The modified IDM process used to assess the department and is depicted in Figure 1.

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[13] Kenndall, Kenneth E. and J.E. Kenndall, <u>Systems Analysis and Design</u>, 3rd edition, pp. 736 – 737, Prentice Hall, Englewood Cliffs, New Jersey, 1995

[14] Ibid. p. 736 – 737.

[15] Bakke, Bonita, "Intranet Development Strategy", http://www.informationage.com/ppr_authorsbsite.htm, Information Age, Inc., Nov. 13, 1996.

[16] Kenndall, Kenneth E. and J.E. Kenndall, <u>Systems Analysis and Design</u>, 3rd edition, pp. 7 - 12, Prentice Hall, Englewood Cliffs, New Jersey, 1995
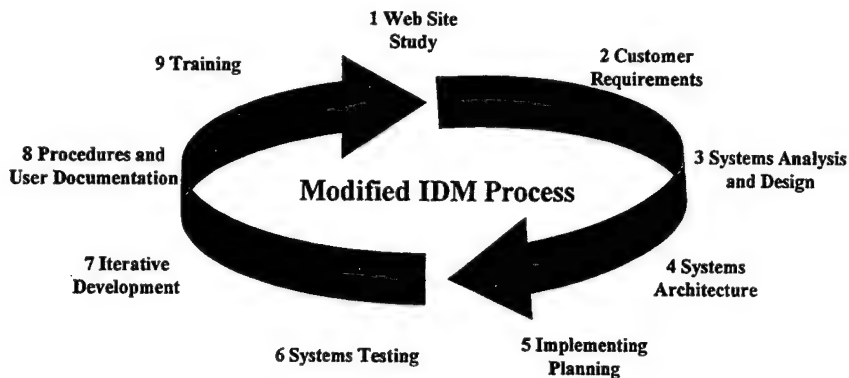
Figure 1: Modified IDM Process

A brief explanation of each phase of the modified IDM process and the results of conducting these phases are explained below.

a.　　　**Web Site Study**

This phase involved a detailed study the existing system, to identify bottlenecks in information flow and opportunities for improvement. The results of the study were used to determine the need, relevance, and potential impact of Intranet support to various components of the system. This information was then used to develop a time line and rough estimate of cost of system hardware and software needs, as well as, the cost of development.

b.　　　**Customer Requirements**

The requirements of customers were obtained primarily using interviews. The fact-finding mission of this phase helped in identifying problems, opportunities, in clarifying objectives, and information requirements. The top-down methodology for

determining these requirements proved practical for this study. Gathering details of overall user needs and system requirements and assembling this information to analyze the current processes provided abundant material to generate formalized customer needs. Further results obtained through use of this research method yielded an organizational structure, business functions performed, and outside entities affected by the use of an Intranet application. Moreover, this helped in determining whether existing application systems could be used within the Intranet system.

Aside from interviews, forms and reports used by the department were collected to assist in determining customer requirements, enabling familiarity with information the customer uses on a daily, weekly, and quarterly basis. The forms and reports were used to develop identical HTML based forms for migration onto the web. This allowed the information to be kept in a format that was familiar to the user. Involving the user in the research phase yielded numerous benefits, including instant feedback, reduction in the amount of training and lowered resistance to change due to unfamiliar media and formats.

c.   **System Analysis and Design**

After gathering all of the customer's requirements of the major processes involved were developed. This was then transformed into high level through primary data flow diagrams (DFDs) (Appendix A). This provided an understanding of the entity to process relationships by grouping related business functions and possible computer processing requirements. Data Flow Diagrams allowed selection of a logical implementation plan for an Intranet system, and further define project time and costs.

d. System Architecture

This phase of the process is mainly concerned with the application of the current process. Since there was no current automated application available, a study of the relative equipment configuration, software used in day to day activities, and the network design that would allow migration to the Intranet was conducted. Since there were no current automated processes, and therefore no electronic database within the department to migrate, data migration was not evaluated. An assessment of telecommunications requirements needed by the Education Technician or Server Administrator, or whoever is placed in the position to maintain the Intranet system is described within customer requirements of Chapter III.

e. Implementation Planning

After developing a sound design and architecture for the system, consideration must be given to Intranet start-up procedures. This process is continuous and iterative and must be considered at each step in the modified IDM process. Products resulting from this stage are definitive hardware and software requirements, conversion requirements for the user information, and a plan for implementation. In this thesis, the conversion requirement is specific to the Department of Systems Management. The conversion of the existing database of courses is not essential to implementation of this prototype. The prototype program will encompass departmental courses only and can be easily input into an existing database system, currently, as there is no computerized departmental database.

f.   Iterative Development

A prototype was built rapidly for the customer to gain a quick appreciation of the capabilities and possibilities of an Intranet system. Once the infrastructure issues were answered, the Website development was quick. "Low cost, high-speed development cycles make long debates over design a waste of time."[17] The trend now is to get an application into user's hands as quickly as possible.

The interviews permitted assessment of the highest priority tasks (those with the highest impact and used by the most number of users), helped determine recommendations for the technical architecture (software, hardware, and telecommunications) and provided migration paths to implementation, as well as, determining policy and operating issues. Iterative development is simply working within the continuous loop of the modified IDM process as depicted in Figure 1, continually reassessing progress and ensuring that departmental priorities are still valid and met.

g.   System Testing

Testing the system means literally putting all the pieces of the Intranet system together ensuring that the system works and provides the necessary information and correct integration of manual and computer activities.

The testing strategy used to satisfy this requirement was to determine an objective, define tasks and responsibilities within the team, define procedures for testing by including the user, document test results through printouts of the products produced by the prototype, and implement necessary program, design, and documentation changes.

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[17] Vinson, Sam, "Intranet Politics and Technologies", Byte, v. 22, no. 5, pp. 88a-88h, April 1997

The majority of problems were found directly through programming and testing of the Cold Fusion code. The concluding deliverable for this phase was to implement a demonstration/validation of portions of the Intranet to a test bed of students and faculty. This not only proves the Intranet system and the system's value, but also allows the user to get a feel for the system and provides immediate test feedback to implement necessary changes.

h.   Procedures and Customer Documentation

This phase of development deals with defining and documenting the manual and customer procedures that support and/or interface with the automated application system. The documentation is written at a level that the customer understands. The documentation links the manual and automated components of the system.

The deliverables for this portion include the following:

a. Data Notebook including a copy of the printed code and associated web page.

b. System Overview

c. General Description

d. Intranet Interfaces

e. Key terms

f. System documentation overview

g. User procedure manual

h. System documentation manual

Each of these deliverables will be discussed in detail in Chapter III and the User's and Administrator's manuals.

i.   Training

This phase is most critical for the administrator who will be charged with maintaining and continually developing the system as department needs change. This phase is also used to support training of the primary user, the Department of Systems Management's Ed Technician on the use of the system. User training sessions will not be as extensive, since the customer was kept involved for most of the development and rapid prototyping.

Ease of training was a design goal for this prototype. The authors deliberately built pages that have only a few possible action buttons and much of the input is done with drop down boxes. Ease of training is one of the primary benefits of Intranet based information publishing. The only application a user need learn is the use of a web browser and any specific actions for enterprise specific pages. The WWW browser and Webserver handle all printing, saving and formatting. It was assumed that a general level of knowledge of web browsers and underlying basic HTML authoring techniques and the use of email exists within the department, composed of about 50% Information Technology professionals.

III. SYSTEM DEFINITION PHASE

A. METHOD

The purpose of this phase is to study the existing system, determine customer requirements, and develop logical process data flow diagrams for the proposed system. This phase encompasses the first three phases of the modified IDM model, Web Site Study, Customer Requirements, and Systems Analysis and Design explained in Chapter II. System Architecture will be discussed briefly, and will be discussed in detail later in Chapter IV.

1. Web Site Study

The interview with the Education Technician in the Department of Systems Management allowed formulation of a specific need and conceptual application of an Intranet for the department. This phase is broken into three parts: the current system, anticipated needs, and rough cost of development.

2. Background

The Naval Postgraduate School Department of Systems Management is the largest department at the school. In terms of being the largest, the department houses over 500 students whose studies encompass 20 different areas. After an initial discussion with the Information Technology Management Academic Associate and a subsequent interview with a professor within the school's Department of Operations Research, the enormity of the project was realized and the thesis was scaled to focus and concentrate in one area, the Department of Systems Management. Realizing that each department is different, a more feasible solution was to concentrate efforts to build a rapid prototype for

Department of Systems Management, and at the same time ensure its scalability and migration ability to any department at NPS.

3. The Current System and Deficiencies

Through interviews and study of the thesis conducted by Nolan and Youngblood[18] at NPS, a determination was made that the course scheduling process has not changed since 1958. In this respect, the school still conducts scheduling manually. The reasons for not changing the current system are explained below.

There is considerable resistance to automation of the scheduling process and even resistance to students conducting research toward automating this process. This resistance further supported the decision to focus on one department. The argument against automating the process all focus around the fact that the problem is a complex combinatorial problem.

The Naval Postgraduate School scheduling system is a unique "pull" system. Simply stated, this system is dependent on the students who attend the school and the courses they must take to fulfill their degree in the time allotted for them to be at this duty station. Curriculum groups (of officer students) come in together and graduate together, so schedules are tailored to accommodate these groups. Some new arrivals validate courses and therefore must arrange different schedules than was initially given, however the majority of officers will have the same schedule through their stay. Aside from academics, the needs of the Navy, Marine Corps, Army, and Air Force influence the

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[18] Nolan, Jeffrey S. and P.D. Youngblood, "Naval Postgraduate School Scheduling Support System (NPS)", Thesis for the Naval Postgraduate School, Monterey, California, March 1992.

scheduling process. Research has not shown how any automation will save money, however it has validated these facts. The current system requires two schedulers. This would also be the requirement to run the automated system. This is primarily due in part to the amount of courses and number of students serviced. It would be overwhelming to have one individual keep up with the scheduling system and secondly, the need for a backup is filled.

As a complex combinatorial problem problem, it cannot be solved with an 80-90% automated solution with the final 10% being human solved. The barrier here, is the generative learning that goes on as the initial scheduling is done. The early guidelines of the problem and solution are somehow learned by the schedulers, asking a human to step in and take up where the computer left off will not lead to a solution, because the human has not had the benefit of "training" his/her brain throughout the process.

Aside from the amount of man-hours involved in constructing individual student schedules, there is a consumption of an enormous amount of paper. Although getting the schedules to paper is an automated process, schedulers still rely on manual means to assign students to courses and courses to classrooms.

The Department of Systems Management employs one individual, the Education Technician, who is the focal point of the department's course scheduling and administrative tasks. Most, if not all, information produced in the Department of Systems Management is paper based. The Education Technician spends 50% of actual work time walking the halls collecting information and paper forms from professors. This collection time is obviously not productive time. The information is not readily available, nor is the

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information in an acceptable format to warrant professors to take time from their schedules to write in or type the needed information on paper based forms.

Little, if any, information within the department is computer-based, as discussed in the previous chapter. Most computer-based information resides in databases maintained by the Registrar at NPS. This legacy system however, is becoming archaic and will soon have to be scaled up. The most efficient way to do this is through Intranets, as Intranets take advantage of web based technologies and can be extensively tied into existing database systems. The Department of Systems Management is an excellent candidate for an Intranet. The department is in need of a technology boost and migration to a web based system, justified by the fact that the only online information used by the Education Technician is a database containing the courses being offered during a particular quarter. There is no database used to track significant data such as faculty, textbooks, courses (aside from course registration at the Registrar), course journals, student observation forms, faculty preferences, thesis assessments or general information. All documentation of this type is manually generated and paper based. The amount of paper being produced each quarter is phenomenal and unwarranted.

All personnel in the department that are involved in information generation and processing have either access to or physically own a computer with word processing software and connection to the department LAN.

The Education Technician has the following hardware and software to conduct routine activities:

Gateway 2000, 486 DX2 66MHz processor

Windows 3.11 Operating System

Primary software is Paradox for instructor and schedule database and WordPerfect (version 5.1 for DOS) for any memos or day-to-day activities.

Current network connection is through Banyan Vines, which is used for email only and serves no other function at this time. There is no direct link to the Department of Systems Management.

The computer has no TCP/IP connectivity.

All reports are prepared with WordPerfect.

Primary users of the information must make requests for specifically formatted reports directly to the Education Technician. (Note. Primary users will be discussed later in this chapter under Customer Requirements.) These reports include: Course Offerings, Faculty Teaching Assignments, Faculty Preferences, Textbook Requirements, End of Course Journals, and Thesis Advising and Thesis Quality Assessments. These forms and reports are the most widely used by faculty. The forms listed above and others used by the department can be found in Appendix B. These forms and reports may well be served as public domain for the faculty members, as the database is not shared with them.

Linking the database to forms is conducted in a rather archaic fashion. Manual inputs of information are made from the database to the word processor (i.e. there is no link from the data to the report). To prepare any report, the education technician first searches the database (does not create or run queries) and notes the information needed, then retypes the information into a word processor employing the same computer used to retrieve the information.

4. Anticipated Needs

The department is in need of revamping the current database system and structure. This includes a more current operating system, word processor, database system, a web server, dynamic database interface utility and component upgrades to the hardware system. The specifics needs and recommendations for both hardware and software will be discussed later in Chapter V, Implementation Issues. Upgrading hardware is a relatively inexpensive investment, considering that small upgrades can yield increases in performance and efficiency ten fold, i.e. upgrading from a 486 to a low end (133Mhz) Pentium Processor. A need that draws some attention is a trained systems administrator who will maintain and update an Intranet System once installed. Training is also an issue that will be discussed in Chapter V and will include the Systems Administrator, Education Technician, faculty and students.

5. Estimated Cost of Development

Current cost of development for the Intranet System to facilitate information flow for existing processes is minimal. Hardware and software costs will run roughly $3,000. The rough estimate is based on obtaining a more current Pentium hardware system and software products such as Cold Fusion, Microsoft Office, Web Site (Server software), and Homesite (HTML editor). These are very rough estimates and consideration must be taken in the fact that hardware prices literally drop on a daily basis. By the time this thesis is produced, the rough cost could be as low as $2,500.

The uniqueness of this thesis allows for a minimal cost of development. There are no labor costs, since both authors are students and are paid by the government. The only costs incurred by the department were for software, as the computer system was

borrowed through another professor in the department, therefore a sunk cost. Software costs include Cold Fusion at $199, Website Pro Server at $499, and Homesite at $40.

6. Customer Requirements

"The best way to decide what to put on an Intranet is to walk through key departments and find out what bits of paper are hanging on the wall. The reason they are there is for the operational needs of the individuals."[19] Aside from interviews conducted with the department's Academic Associate and Education Technician and an initial interview with a professor in the Department of Operational Research, this was literally the approach taken. As students at the school, the authors have first hand knowledge of information requirements and qualified us as customers of information to determine these requirements. Walking the halls of the department and reviewing information posted on bulletin boards validated information needs.

The Academic Associate provided insight to a development strategy and in areas to focus. The Academic Associate assisted in better defining roles of individuals in the Department of Systems Management and relationships to entities on campus. A concern raised during this interview was his specific lack of faith in the FOCUS Database system now used by the school. The format of information presented by FOCUS cannot be modified to fit this need; therefore, the user perceives little value returned for his/her use and the system then becomes user-unfriendly. FOCUS is provided to all professors in the department, but because of the interface, avoided as much as possible (FOCUS is the

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[19]Schwartz, Karen D., "Weaving an Internal Web", DoDIT, an Army, Navy, Air Force Times Marketing Supplement, May 19, 1997.

primary tool for the Education Technician within the curricular office to input and retrieve information to and from the registrars' office).

An interview with the Operations Research professor was helpful, in restricting the scope of this thesis to one department and excluding course scheduling.

Course Scheduling was still a concern. Although the product of this thesis is to develop an Intranet for information sharing for the department, there still exists a need to develop some type of course scheduling database that is easily manipulated by students and faculty. For this, a common, but robust database system would need to be developed to implement course scheduling or at least a storage media for courses being offered for a particular quarter or variety of quarters. An important fact when designing the database is that 33% of students change their schedule within the first two weeks of class each quarter.[20] Moreover, students must have this type of availability to easily access a site which presents them with the courses required to complete their degree, offers the ability to manipulate the schedule based upon NPS requirements and their needs, and offers Education Technicians the ability to simply manage an HTML page and make necessary updates based on instructors, courses, and classrooms.

The most significant information was obtained from the Education Technician, who will be a direct user of the Intranet system, if not one of the maintainers. The Education Technician serves as the liaison between the NPS Schedulers and the department and also liaison between the curricular office and the department. The current information requirements essential to the Education Technician are class

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[20] Interview with Professor Gordon Bradley, Professor Department of Operations Research, Naval Postgraduate School, Monterey, CA, 25 October 1996.

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schedules, courses, student data, faculty data, and course data including instructors, students, classrooms, journals, and textbooks. The current hardware and software system in place for the Education Technician, as discussed previously in this chapter, is a limitation.

The current manual information system was found to be inadequate for the department. Information support to faculty members is lacking through no fault of the departments. The responsibilities of the Education Technician include: Student validation, dissemination and collection of the Student Observation Forms (SOFs), faculty registration and assignments, faculty preferences/requirements worksheets, thesis advising and thesis quality assessment reports, and systems management end of course journals, and textbook ordering. Copies of each of these forms and reports are contained in Appendix B.

One of the major outcomes of the analysis of customer requirements was the identification of the individuals (entities) involved in the processes being developed. The key entities include the following: department education technician, curricular office education technician, faculty, students, associate chair for instruction, schedulers, database administrator for the registrars office, department chair, and the department academic associates. The current organization structure for the department is found at Figure 2, which depicts only the relevant entities.
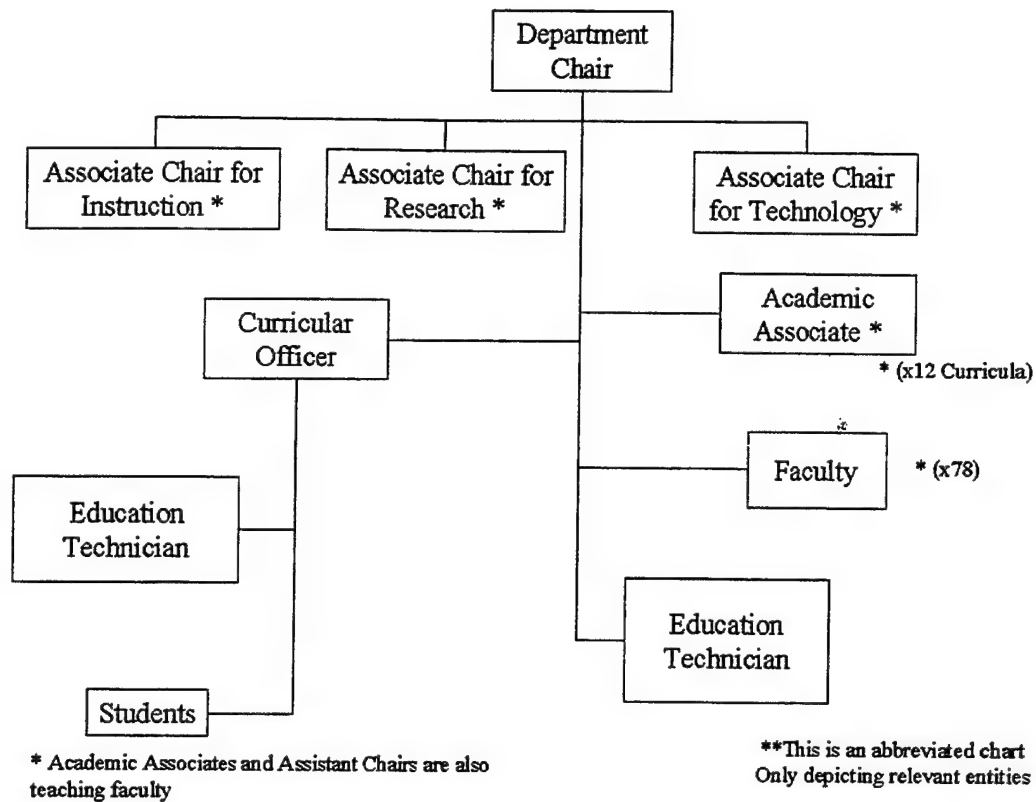
Figure 2: Relevant Entities

7. Systems Analysis and Design

Through the interviews, entities for systems analysis and design were discovered. "A large part of systems analysis and design involves working with current and eventual users of the information."[21] Copies of current forms and reports were collected to use as formats for the information system. A design goal was to present an interface that closely resembled current paper based means. This approach presents a consistent interface to

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[21]Kenndall, Kenneth E. and J.E. Kenndall, <u>Systems Analysis and Design</u>, 3rd edition, p. 5, Prentice Hall, Englewood Cliffs, New Jersey, 1995

the users. The processes for systems analysis and design are Course Support, Student Observation Forms, Thesis Topic, Student, Advisor Recording, Course Validation tracking and reporting, End of Course Journals, and Thesis Assessment Reports. The entity to process relationship Level 1 Process Diagram is shown in Appendix C and is explained in detail below.

a.   Course Support

The Course Support process is the largest of the processes. This process is further broken down into five subprocesses. The subprocesses are inputs to NPS schedulers, schedule validation, assignment of resources which includes assignment of faculty to instruct courses, faculty preferences, assignment of students, textbook ordering, and administrative tasks such as updating and deleting faculty and courses. Subprocesses, inputs to NPS schedulers, schedule validation, assignment of resources, faculty preferences, assignment of students, and textbook ordering, follow a logical sequential flow and cannot be completed in parallel. The database administration task is the only subprocess that can be accomplished at any time, in parallel to the complementary subprocesses. Level two and three data flow diagrams for Course Support can be found in Appendix C.

Although large, the course support process is a simple process. The department's Education Technician consolidates course requirements from the department and curricular offices and validates these entries to ensure that there are enough (at least nine) students requesting a specific course. If there are not enough students requesting a particular course, a memo is sent to the Curricular Office stating that the particular course will not be offered.

The validated course requirements are submitted to the campus wide database administrator who is responsible for input of all scheduling information into the scheduler's database. The database administrator provides tailored department specific quarterly course listings to each NPS Department.

The Department of Systems Management Education Technician validates the returned schedule (first iteration) by noting courses needed (from student and curricular office input) and the number of students in each class. Two reports are produced from the first iteration. The first report is a Course Listing Worksheet for the particular quarter in question. This worksheet is used to produce the second report, "Course Offerings, x Quarter 19xx" .The worksheet shows the courses offered, number of students enrolled, number of sections, number of sections required, academic year scheduled sections, and any comments needed for clarification. As stated previously, the courses are validated to ensure that each has enough students requiring the course and if not the course is canceled for that particular quarter.

The second iteration, which implements the changes, noted from the first iteration and is validated for gross errors or omissions. The Education Technician uses the second iteration to assign faculty members to each course. Upon notification the faculty member provides input of any special requirements for that subject/course, using the Faculty Preference worksheet at Appendix B. These requirements may be labs, special software, class size, or other scheduling constraints.

Text ordering is the final step of the course support process. After submitting preferences to course instruction to the Education Technician, the faculty member provides information on the textbooks required for the course of instruction. The

Education Technician receives blank forms from the Naval Exchange (NEX). The form is called the textbook worksheet and is a multi-sheet form. Once complete the back copy is retained and two copies are forwarded the NEX. A general business rule is that one textbook ordering form is used for each faculty member for each course he/she is teaching. The faculty member teaching the course and the Associate Chair for Instruction requesting the textbook(s) must sign each form. This process seems a bit unnecessary as there are two individuals that must verify with signatures that the book requested is needed and moreover, having one textbook ordering form per instructor and course yields much redundant paperwork. The solution is to have one consolidated spreadsheet or requisition per department or if the department is large enough, a consolidated spreadsheet per curriculum within the department each with a single signature by the Associate Chair for Instruction. Currently the process requires the Education Technician to deliver these forms to the NEX for processing. Automating this processing by linking the NEX to the Intranet would alleviate paper altogether. This change involves the change of a current business rule and will be addressed again later in Chapter V, Implementation issues.

The final process of the course support is grouped here simply because the process involves faculty and courses and provides a maintenance aspect for this process. The ability of the Education Technician to control the input, updating, and deletion of courses and faculty members as courses are added and faculty arrive and depart is an important aspect of any database system and the process can be easily migrated to an Intranet system. Currently, there is no automated system in place to accomplish this task.

b.   Student Observation Forms (SOFs)

Each quarter students complete these evaluations on the instructors with whom they are taking classes.   Attributes of the SOF are; course number, segment (section), instructor name, report number (to fields - sub sof # and sof #), curriculum specialty # (for the student), hrs student taking this quarter, # of quarters completed, whether the course is required or elective, 16 - 20 questions (17 -20 are optional/extra questions) and a space for open format questions.

The current SOF Process involves sealed envelopes starting at the schedulers routing through the Education Technician to the student, forms are filled out by the student, returned to the Education Technician in a sealed envelope, then returned to the schedulers for processing. The Education Technician only performs a routing and accountability function within the department. During processing by the schedulers, mean scores and a write up are completed for each faculty member. A Department Chair report is prepared that shows faculty members mean scores. Written comments are consolidated and sent to each faculty member. Because of the sensitive nature of both reports, the reports are not included as part of an appendix in this thesis. The Education Technician's function is only to route these reports to the appropriate instructor for their review.

c.   Thesis Topic/Student/Advisor Recording

The Education Technician records the title, student name and advisors for each thesis.   This information is obtained from thesis proposals.   For advisors, the Education Technician also records the role (Advisor, Co-Advisor, or Associate Advisor) of the faculty members involved.

d. Course Validation tracking and reporting

The Education Technician is also involved in determining eligibility of students for certain course validations prior to them arriving at NPS. The Education Technician records the courses validated by each student in the department. The Education Technician also must track and report validation statistics for any classes validated while a student is enrolled. The ability for students that have had prior experience or course work in a particular subject, to "test out" and open up their schedules for other opportunities or course work at NPS or even early graduation. The Education Technician conducts this process, as time permits, between working with Course Journals and the Thesis Assessments. After the Education Technician sends the NPS Schedulers the second iteration of the schedule, newly arriving student transcripts are pulled and reviewed to determine if a student is in a position to validate any courses. There are two lists of available classes for validation, one for 370 (Information Technology Management (ITM)) and another for all 800 series curricula. The Education Technician determines acceptability by reviewing courses shown on the student's transcripts with a list of classes open for validation. If a student is determined to meet the criteria to attempt validation, a cover sheet, validation form (Appendix B), and the student's transcripts are sent to the instructor with responsibility for a particular course. When the new student arrives at NPS he/she will be informed by the Academic Associate what classes can be validated. Validation can take place via three methods (each of these methods are course dependent): Validation through transcripts, Validation through interview, and Validation through examination.

If there is an examination involved, the Education Technician is responsible for administering and grading the exams to determine if the student gets validation credit. Completed validation forms go to the curricular office. The curricular office provides input and signatures, then sends the validation to the Department of Systems Management for final approval.

Prior to the Academic Year 1997, the Education Technician produced a report (Appendix B) detailing statistics of classes validated by only incoming students by quarter. This year the report will detail all classes validated (existing students and new students). This report goes to the department's Associate Chair for Instruction.

The report can have many formats: by student, by class, by student type (new or "veteran"), by curriculum, by quarter, by year. Currently, completed validation forms are not routed to the Education Technician from the curricular office. The education technician must physically go to the curricular office education technician for this information.

e.   End of Course Journals

At the end of each quarter a course journal is prepared by a professor(s) teaching a particular course. The end of course journals provide the department with four pieces of key information. First, these journals provide new instructors with the information and ideas about what have been form, format, and experience in teaching a particular course.   Second, they provide the faculty colleagues with readily available information about the level and nature of preparation of students who will be entering their courses. Third, the journals also provide the department with a comprehensive "corporate memory" on the content and recent experience of classroom instructional

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program. Lastly, they provide the chairman with additional data for annual performance appraisals for individual faculty members.

The course journals are also a good reference in providing detailed specifics in regards to textbooks used and class grade distribution. These journal documents should not be accessible by students.

f. Thesis Assessment Reports

Thesis Quality Assessment Surveys are completed at the end of each quarter. This report provides the Systems Management faculty a complete picture of what they think about the value of the theses they were involved. The report indicates how the faculty is doing and suggests where and how the faculty member can improve in making the thesis a valuable educational experience that contributes to both the student's future career success and also help the Department of Defense (DoD) more effectively address its current and anticipated challenges.

8. Process Analysis of Key Processes

Level two and three data flow diagrams (Appendix C) further break down the higher level processes to their primary elements yielding products which show individual tasks conducted by each process and their interaction. This further allows a microanalysis of each process to determine exact information needs. The following paragraph details each process mentioned previously, providing a logical flow of information to the process' primary structure. For a process template contains the following information was used for analysis:

Entities Affected. Properly identifies the individual or organization, which interacts with the process or acts on the process.

Number of Users. Users in this environment are restricted to Academic Advisors, faculty, students, and the Education Technician.

Primary Owners. Primary Owners are those who own the data, input data, and control output of the data for documents such as memorandums and reports submitted by the department.

Frequency of Use. This is limited to the following use criteria: Daily, Weekly, Quarterly, and Annual.

Frequency of Update. This is limited to the following use criteria: Daily, Weekly, Quarterly, and Annual.

Mode of Use by Entities. Each of the processes will allow one of the following to take place: single update, single query, multiple updates, multiple queries or any combination. Single update applies to one entity or individual acted upon. This mode of use allows or requires the user to make an update on a single entity. Single query allows the user to access information on a single entity or individuals. Multiple updates allow or require the user to make multiple updates to several entities or individuals. Multiple queries allow the user to access information on multiple entities or individuals.

Type of Information.

Generic vs. Customized: This information applies to data, which is either used routinely or created for a given situation or need. A determination will be made specifying who the information is pertinent too and when the information would be needed (daily, weekly, quarterly, and annual).

Privacy vs. Non-Privacy: This information applies to data, which is either sensitive or non-sensitive in nature. When analyzing each process a determination will be made as to the privileges and permissions granted to an entity.

Classified vs. Unclassified: This information applies to data which is either classified or unclassified as determined by the Department of Defense (DoD) and further specified a higher classification as determined by NPS.

Source of Information: This information applies to the origin of data used by entities.

Current Status: This element of analysis describes how the current process is conducted. It will answer questions such as: Is the process being conducted manually or is it semi-automated? Where is the information stored? Who maintains the current information?

Miscellaneous Information: If needed, this element of analysis will be added to cover any pertinent information not included in the previous elements.

The template described above will now be used to examine each of the processes selected for analysis.

Process 1: Course Support

Entities Affected: Education Technician (Department and Curriculum Office), NPS Database Administrator, Faculty, and Students.

Number of Users: All Students and Academic Advisors.

Primary Owners: Education Technician (Department)

Frequency of Use: Daily to Quarterly

Frequency of Update: Quarterly

Mode of Use by Entities: Multiple Update, Multiple Queries

Type of Information:

Generic vs. Customized: This information would be customized for each quarter. There will be the ability to obtain generic course information and course offerings each quarter. The customized information would pertain to individual students and faculty instructing classes.

Privacy vs. Non-Privacy: The Database Administrator and Education Technician for the Department will have Administrator privileges. Faculty and students would have limited use such as update capability, however, a student cannot change or view another student's schedule, a faculty member cannot change a student's schedule. A business rule would have to allow students to request change in courses through both Ed. Technicians who would get approval and input changes.

Classified vs. Unclassified: Unclassified within the bounds of NPS. Classified outside the firewall.

Source of Information: Course Catalog and Paradox Database.

Current Status: Scheduling is done manually. Courses are kept on a database. The scheduling process is a manual process with electronic filing. Within the Department of Systems Management courses are kept on a Paradox Database System.

Process 2: Student Observation Forms.

Entities Affected: Department Chair, Database Administrator, Education Technician (Department), Faculty, and Students.

Number of Users: Students and Faculty.

Primary Owners: Database Administrator and Education Technician(Department)

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Frequency of Use: Quarterly

Frequency of Update: Quarterly

Mode of Use by Entities: Single Update, Multiple Query

Type of Information:

Generic vs. Customized: Student Observation Forms are customized forms of information relating the student to the instructor and the course taught.

Privacy vs. Non-Privacy: Must maintain privacy. No entity needs to know who turned in which SOF and its contents. The Education Technician (Department) is the collector of SOFs for the department (given to her in a sealed envelope). Department Chair is given a Department synopsis. Faculty are given the assessment and SOFs at the beginning of the next quarter. Care is taken to ensure there is no perception that SOF input effect grades.

Classified vs. Unclassified: SOFs are classified information and must be treated as such.

Source of Information: Database Administrator provides the necessary forms. Students provide the input.

Current Status: Process 3 is partially automated. Students provide assessments in a Mark-sense form and also provide written comments. Forms are placed in a machine to compile and assess results (automated portion of the process). A summary is provide by the Registrar and provided to each Department Chair.

Process 3: Accounting and reporting

This process combines two Level 1 processes, Thesis Topic/Student/Advisor Recording and Course Validation as both are closely related administrative tasks performed by the Education Technician, faculty and students.

Entities Affected: Department Chair, Associate Chair, Education Technician (Department), Faculty, and Students.

Number of Users: Currently there are 78 faculty.

Primary Owners: Education Technician (Department)

Frequency of Use: Daily, Weekly, and Quarterly

Frequency of Update: Bi-Weekly

Mode of Use by Entities: Multiple Updates, Multiple Queries

Type of Information:

Generic vs. Customized: Thesis Topic/Student/Advisor Recording will provide customized information. Course Validation will provide generic information.

Privacy vs. Non-Privacy: The Education Technician (Department) will have Administrator privileges. Privacy for Thesis Topic/Student/Advisor Recordings. Course Validation is a simple matter of ensuring that a course will be taught in a given quarter, therefore requires non-privacy.

Classified vs. Unclassified: Topic/Student/Advisor Recordings is classified material from the standpoint of Professor/Student relationship. There may need to be the ability to view validation statistics on a generic basis with no security limitation. There is no need to limit access to the overall statistics.

Source of Information: Course Catalog, Paradox Database, and previous quarter thesis recordings.

Current Status: Process 2 is done manually with all documentation being recorded and stored on a PC.

Miscellaneous Information:

Process 4: End of Course Journals

Entities Affected: Department Chair, Associate Chair, Academic Associate, Education Technician(Department), and Faculty.

Number of Users: Approximately 150 faculty.

Primary Owners: Education Technician (Department)

Frequency of Use: Quarterly

Frequency of Update: Quarterly

Mode of Use by Entities: Single Update, Multiple Queries

Type of Information:

Generic vs. Customized: Course Journals provide a customized tool to explain course statistics and format.

Privacy vs. Non-Privacy: Information provided by the faculty should be shared with other faculty, but not the student population.

Classified vs. Unclassified: Not applicable.

Source of Information: Instructor providing instruction for the course. Textbooks are a source of information. Another possible source of information is through student SOFs.

Current Status: Process 4 is done manually with all documentation being recorded and stored on a personal computer.

Process 5: Thesis Assessment Reports.

Entities Affected: Department Chair, Education Technician (Department), Faculty, and Students.

Number of Users: Approximately 250.

Primary Owners: Education Technician (Department)

Frequency of Use: Quarterly

Frequency of Update: Quarterly

Mode of Use by Entities: Multiple Updates, Single Query

Type of Information:

Generic vs. Customized: Customized information

Privacy vs. Non-Privacy: The Education Technician (Department) will have Administrator privileges. Faculty members should not be able to assess other faculty reports or know the points awarded to another faculty member. Information is irrelevant to the student population.

Classified vs. Unclassified: Should be kept as classified information within the department and released only at the discretion of the Department Chair.

Source of Information: Faculty and Student individual assessment.

Current Status: Process 5 is conducted manually. Students and advisors fill in the necessary information then turn into the Education Technician (Department).

9. Selection of the Prototype Processes

Through the use of the above technique in analyzing the processes relevant to the Department of Systems Management, a list of processes likely to benefit from an Intranet were found. The basis for such selection was determined by considering the population

affected, frequency of use, frequency of update, mode of use, and other concerns applicable to the daily functions within the department. The processes likely to benefit from Intranet implementation are listed below in much the same format as the critical analysis above:

Course Support

Population: Very large population

Frequency of use: High frequency during scheduling periods. These high frequency times are the last few weeks and first two weeks of each quarter.

Frequency of update: Frequent during the last few weeks and first two weeks of each quarter.

Mode of use: Multiple Queries

Concerns: Need for current data. The data in a scheduling database must be kept current at all times. The current systems information is not kept current due to the nature of the scheduling process and environment. The Education Technician will use the database for planning and negotiating with the NPS schedulers. Students and faculty will want the data to be accurate and reliable. Because of the changing nature of the scheduling process (up to the last weeks of each quarter) the data could never be entirely accurate. Students would use the "fuzzy data" to make decisions and schedules only to be disappointed when the final schedule was published.

Thesis Topic/Student/Advisor recording

Population: All Students and most if not all of the Faculty

Frequency of use: Weekly

Frequency of update: Quarterly

Mode of use: Single Query and Multiple updates

Concerns: Information changes throughout the thesis process. Currently, there is no way to ensure data is current in the manual files. Frequently, faculty will have discussions with the department chair concerning their contributions during a rated period. The Department Chair uses the database to evaluate contributions.

Course Validation tracking and reporting

Population: Moderate use by Academic Associates, Curricular Officer and occasionally students.

Frequency of use: Quarterly

Frequency of update: Quarterly. The majority of validation occurs in last weeks and first two weeks of a quarter.

Mode of use: Multiple Queries and Single Update

Concerns: The current manual system does not support the Education Technician having current data. The information is maintained in the curricular office, which requires the departmental Education Technician to physically retrieve the data. Currently, the Department Education Technician establishes records for each student at matriculation and has no way to monitor additional validation. Updates to a duplicate set of manual records are done in the curricular office, the departmental records are not kept current.

Student Observation Forms (SOFS)

Population: Large use from the entire student body and all teaching faculty.

Frequency of use: Quarterly

Frequency of update: Quarterly

Mode of use: Single Query and Multiple Updates

Concerns: The current system requires one teaching day to be devoted to SOF administration. An Intranet application would provide cost savings for Mark-sense forms and timesaving for processing the forms. There will be an increase in the turn-around time to the instructor, so that information will be available to implement well in advance of the next quarter. This will offer the faculty a more efficient use of this information. There is also a concern of maintaining and ensuring anonymity of all forms from both the student and teaching faculty standpoint. The concerns surround anonymity after student mark-up and privacy of written comments provided by students and given as feedback to instructors.

End of Course Journals

Population: Faculty use only

Frequency of use: Quarterly

Frequency of update: Quarterly

Mode of use: Single update and Multiple Queries

Concerns: This information is mostly static. Although classes are taught repeatedly, journals are maintained as historical reference for classes. This data can function as an online library for faculty. Faculty may be more inclined to browse the information if the data is readily available. Human nature is a concern as an online resource is more likely to be used by the faculty if the resource is available when they need the journal. Having an online resource allows faculty to prepare for classes on their own schedule. Course Journals will potentially be more current if the update and retrieval is online and real time.

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Thesis Assessment Reports

Population: All Students and Faculty

Frequency of use: Quarterly

Frequency of update: Quarterly

Mode of use: Single update and Single query

Concerns: The thesis assessment report process is designed as a data gathering process. The information is used only to track and evaluate trends in theses. Statistical evaluation is completed by manually keying in scores from the returned assessments. An online form would automate the keying and filing.

10.   Process Impact of Implementation

The following table displays a subjective score of each process considered for prototyping and its impact for implementation. These scores were validated by feedback received from department faculty and administration following the initial prototype demonstration.

Process	Rank
Scheduling	8
Thesis Topic/Student/Advisor recording	7
Course Validation tracking and reporting	6
Student Observation Forms (SOFs)	7
End of Course Journals	7
Thesis Assessment Reports	6

Table 1: Ranking for Intranet Implementation (Impact)(1 = Poor - 10 = Excellent)

The table ranks the impact from one to ten with one being poor and ten being the highest, excellent. Ranking the potential impact of such processes allows visualization and a mental picture of how efficient and effective a process will be to the conduct of daily business in the department and the feasibility of migrating such a process on line. Obtaining a subjective score of less than five would indicate that the process would not warrant inclusion as part of the prototype.

The impact of all the processes are all above average. None of the processes listed are currently automated. Any automation will streamline the process, improve the amount of work the Education Technician can accomplish and improve accuracy. The conclusion is to implement all the above listed processes into a prototype.

11. Entity to Process Relationship

This section is devoted to explain the relationship that an entity will have with the selected processes. This is not to be confused with the database entity relationships where entities are designated as one to one, one to many, or many to many relationships with other entities. An analysis was conducted to determine how the process will impact the user and content providers, the tools required by design, plans to address security related issues, and the roles and responsibilities of the user and content providers, and miscellaneous changes and/or enhancements to the process when compared to the current state.

a. Scheduling

Impact on User: There are no special viewers or tools needed. All NPS faculty and students have access to the WWW at least through the public Unix terminals.

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Additionally, free tools and utilities are readily available from the computer center support staff within the department.

Impact on Content Providers: Cold Fusion and HTML authoring tools are needed on the Server. No special Database tools or applications are needed once the database shell is built.

Tools Required for Design: Website Pro and Cold Fusion are the only tools needed for this process.

Plans to address security related issues: Students can only view their schedule and a generic list of available courses. Academic Associates can access any student's schedules. Curricular office personnel can access all schedules. The department's Education Technician can update and change the database freely.

Roles and Responsibilities of Content Providers and Users: The department's Education Technician or computer systems administrator will need to know how to administer Cold Fusion Pro and Website. Required skills will include adding users, changing permissions, and updating and creating Cold Fusion templates.

Miscellaneous Changes and/or Enhancements to the process when compared to the current state: This will allow the department's Education Technician to view the quarter's courses from a browser viewpoint instead of a database design view. This enhances posting of changes instantaneously without the delay time involved with reprints. Students will be able to view their quarter courses and other available courses in a snapshot. An online version will allow multiple user access and prevent loss of information as opposed to the current system of one or two printed course listings kept in a common area that is locked during non business hours.

b. Thesis Topic/Student/Advisor recording

Impact on User: No special tools required.

Impact on Content Providers: Content provider will be the collector of information. The provider will no longer need to maintain manual files.

Tools Required for Design: Website Pro and Cold Fusion are the only tools required.

Plans to address security related issues: The prototype would allow access only to generic statistics to uninvolved parties (NPS students only). It will also allow Academic Associates and faculty to view information commensurate to their positions. The Department Chair will have unlimited access.

Roles and Responsibilities of Content Provider and Users: Maintain running system and background applications (Cold Fusion and Website).

Miscellaneous Changes and/or Enhancements to the process when compared to the current state: The prototype would eliminate re-keying of data and the current manual file system. This allows for creation of a historical database with broader access and will now fully automate the process through an online format.

c. Course Validation Tracking and Reporting

Impact on User: No special tools required.

Impact on Content Providers: Database application will be necessary to fully realize the multiple queries and reports possible.

Tools Required for Design: Website Pro, Cold Fusion, and Microsoft Access (database application) are the tools needed.

Plans to address security related issues: Allow only the Education Technician to make changes to tables and data. Allow students, Academic Associates, and Curriculum Officers to view data in various formats.

Roles and Responsibilities of Content Provider and Users: The department's Education Technician must update points of contact pertaining to the database and course validation requirements. Course Coordinators must update course validation requirements as needed.

Miscellaneous Changes and/or Enhancements to the process when compared to the current state: Validation testing will remain a manual process. The tracking of validation credit between the curricular office and the department will be consolidated allowing both to have current information.

d. Student Observation Forms (SOFs)

Impact on User: No special tools required.

Impact on Content Providers: No special tools required.

Tools Required for Design: Website Pro and Cold Fusion are the only tools needed.

Plans to address security related issues: A student's anonymity must be ensured. Students are limited to one input per course within the quarter for which they are currently enrolled. Faculty access must be restricted until after grades are posted, furthermore must be restricted to the course taught. Faculty are restricted from making SOF input. Department Chairs may have unlimited access to all departmental courses. Academic Associates restricted to area commensurate to their position.

Roles and Responsibility of Content Provider and users: The department's Education Technician is responsible to set up administrative information for each course, i.e., Course Number, Instructor, SOF Number, and Student Participation.

Miscellaneous Changes and/or Enhancements to the process when compared to the current state: The department's Education Technician will maintain administrative information. The prototype will allow migration of the entire process from a manual based system to a fully automated process. This eliminates the need to use class time for the administration of SOFs.

e. End of Course Journals

Impact on User: No special tools required.

Impact on Content Providers: No special tools required.

Tools Required for Design: Website Pro and Cold Fusion are the only tools needed.

Plans to address security related issues: Access will be restricted to Faculty only, with no student interaction possible.

Roles and Responsibilities of Content Provider and Users: Faculty will provide the Education Technician with quarterly updates to the course taught in a specific quarter.

Miscellaneous Changes and/or Enhancements to the process when compared to the current state: Currently the process is manual. Providing an online format will enhance the efficiency, effectiveness and use of these journals. The online and readily available format will encourage faculty to use and update the journals in a timely and routine manner.

f. Thesis Assessment Reports.

Impact on User: No special tools required.

Impact on Content Providers: No special tools required.

Tools Required for Design: Website Pro and Cold Fusion are the only tools required.

Plans to address security related issues: Access will be limited to involved parties and departmental leadership.

Roles and Responsibilities of Content Provider and Users: Faculty and students must submit their information as required at the end of the thesis process.

Miscellaneous Changes and/or Enhancements to the process when compared to the current state: The current system is completely manual. An automated process avoids re-keying and will support the development statistical analysis of the thesis process.

12.   Systems Architecture and Design

According to one of the system administrators, all Department of Systems Management professors have some form of computer and TCP/IP access. Systems include Apple Macintosh, IBM PC or compatible or Unix. The number without direct connections is very small and all instructors will be able to directly access the network by the end of Winter 1997 quarter (March 1997), after implementation of the new network system being built for the department. Those instructors that don't have direct access to the network can connect through dial up connections. Once again, this will not be necessary after March of 1997.

The system will consist of client machines and server machines. Datafiles can exist on either the server or any machine on the network, as long as appropriate access permissions are given to allow access.

The client machines will be located in offices of faculty and staff of the department. The specific software required for a client is minimal and will be discussed in Chapter IV. Server software will also be discussed in Chapter IV.

The physical location of a machine will not have any impact on the functionality of that machine. The server machine should be provided with adequate security to prohibit alteration of data or HTML pages.

On the server, a directory structure is used to promote both maintenance and security. Figure 3 depicts the proposed directory structure for the prototype. All folders are located under one working directory, wwwroot. The root directory is further broken down into subdirectories associated with the processes, which they represent. HTML pages with related functions are kept in these subdirectories. Any generated data and the datafiles are also kept in separate subdirectories. The proposed directory structure allows the WWW server application to provide much of the necessary security. Access permissions can be granted based on directories and user names or roles. Data security is provided by the security functions of the operating system of the server.

```
Smidss
    DatabaseFiles
    SOFComments
    wwwroot
        images
        Security
            CourseJournal
            CourseMaint
            Courses
            DeptChair
            edtech
            Faculty
            FacultyMaint
            IntraDepartment
            preferences
            SOFForms
            Textbooks
                Requisitions
            ThesisAssessment
```
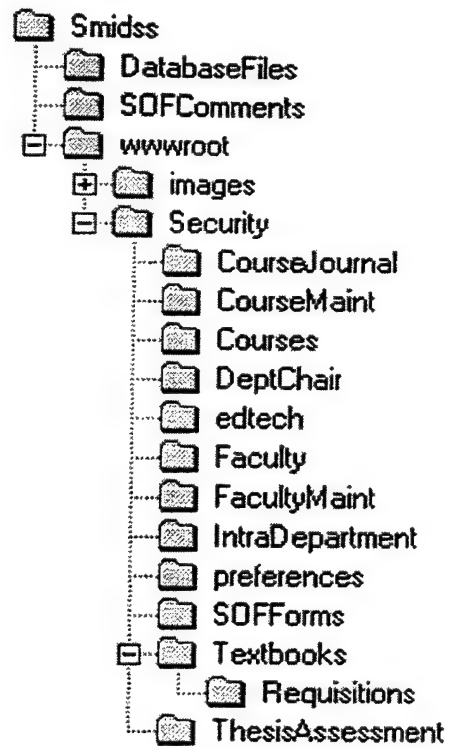
Figure 3: Directory Structure

IV. INTRANET DESIGN

A. INTRANET TOOLS AND PROTOCOLS

1. Basic Components

The components of an Intranet can be broadly classified as either client or server components. In some cases specialized software is required on a client machine to support server functions. In keeping with the purpose of this research, the prototype was designed to function with "dumb clients".[22]

The applicable technologies are Web Servers, Database Servers, Web browsers and the TCP/IP network communication protocol. The web and database servers handle the interface and commands necessary to interface with the user and datasource. The Web Browser handles the communications between the user/client and the Webserver. The combination of the web server and the browser handle all of the information formatting and output commands. The TCP/IP protocol is the standard used for network communication between machines and programs that are interconnected through any number of network hardware architectures.

2. Client

A client machine needs to have, as part of its installed operating system the necessary protocols for communication on the enterprise network. Most Intranets, since they use technologies and tools developed for the Internet, use the TCP/IP protocol. However, proprietary or other protocols are possible since the Intranet is designed to serve internal functions. Protocols other than TCP/IP are beyond the scope of this thesis.

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A client can be either smart or dumb. A "smart client" is one that receives data and information in a raw form and performs some processing locally. A "dumb client" is one that receives only formatted information and only does processing necessary to output the information.

The primary benefit of a "smart client" is that the load of the server is minimized. The primary drawback is that applications and coding is more sophisticated and therefore more costly. These costs involve increased development time and financial cost.

As stated, a "dumb client" is a client that does not process the information. All processing is performed at the server. Clients require only a compatible browser.

The benefits of "dumb clients" are that cost of development, hardware requirements and user training are all kept low. The drawback is that the server assumes the entire processing overhead, so users will perceive some latency in having information processed.

3. Server

In a general sense the Intranet server requires some software to format and deliver information to the network for display on the client machine. The prototype server developed for this research consists of a WWW server and an ODBC server.

The ODBC server processes requests for data by executing the DBML (Database Markup Language) commands and actually interfacing with the database files. The information in these requests is formatted in the HTML pages as an SQL query. The SQL query is passed to the ODBC protocol drivers to access the datafiles.

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[22] Laudon, Kenneth C. & Jane P., Essentials of Management Information Systems, *Organizations and Technology*, Second Edition, Prentice Hall, 1997 p 270.

The datafiles can be in a shared directory anywhere on the network. In fact, ODBC is a good means of combining data from multiple locations in multiple databases. As the ODBC drivers return data, the ODBC server reformats the data into a format that can be transmitted and displayed to the user as an HTML document. The ODBC passes this formatted information to the Webserver to pass to the user.

The use of the ODBC protocol allows one server to access databases designed in different database front ends. For example, an ODBC request can be sent to a database built with Microsoft Access or Borland Paradox. The DBML pages allow this to be handled from the same code or DBML page. The commonality of code allows one application or collection of pages to access data in multiple databases in multiple formats.
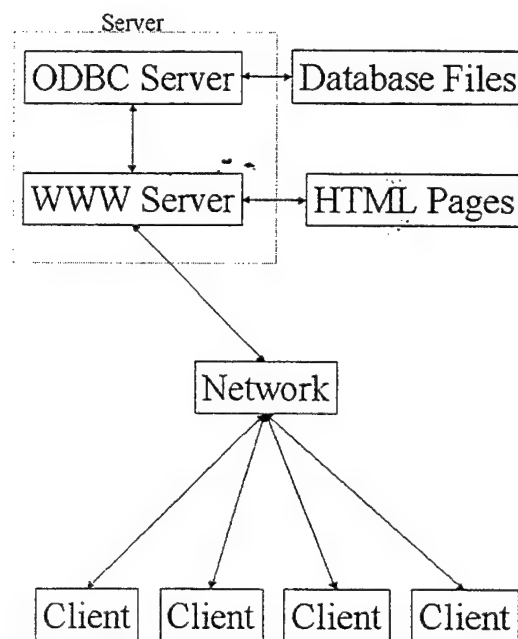
Figure 4: Webserver Architecture

The purpose of the WWW server is to interface with the network and receive and manage requests for information stored as formatted HTML pages. The WWW server also functions to format information requests in a manner that is understandable by the ODBC server. As information is pushed to the network the ODBC server and WWW server work together to publish the information in manner consistent with the HTML protocol.

Common desktop personal computers function well as Intranet Servers. Webserver software that runs on desktop personal computers using desktop operating systems (Window NT Workstation or Windows 95) is readily available and inexpensive. These packages are well supported and new tools are released almost on a weekly basis. Commercial HTML editor programs include an increasing number of DBML commands.

B. TOOL SELECTION

1. Hardware

The hardware that was used for the development of the prototype can be classified as "typical desktop" hardware. The development platforms were a 486 and Pentium class machines. The use of two machines was not necessary. Two machines were used only for the efficiency provided by allowing the developers unrestricted access to a workstation.

An evaluation of different types and capabilities of software and hardware is beyond the scope of this research and is left as a recommendation for future research. Benchmarking or testing the prototype on different platforms is left as future research and will be discussed in Chapter VI.

A test of the server running using the two different machines was conducted. One machine consists of an Intel Pentium 166Mhz CPU, 128 Megabytes of RAM, 2 Gigabytes of hard drive capacity. The second machine is a Cyrix 486 DX2 80Mhz CPU, 20

Megabytes of RAM and 1.2 Gigabytes of Hard Drive Capacity. Both machines were connected to the Department of Systems Management Local Area Network (LAN) via 10Base2 Ethernet.

The test consisted of running a query to retrieve an e-mail address from the database. Each machine had a copy of the database resident on the hard drive, and therefore did not have to compete for access of a central datasource. In order to have similar network/environmental conditions the query action button was pressed simultaneously on each machine. This was done, as much as possible, to ensure similar network traffic conditions. Since Ethernet is a collision sensing protocol, the authors felt that the actual query and result message from the server for each machine would compete equally for a transmission slot on the network.

The test showed that response from the Pentium server was noticeably faster. The response was almost immediate, less than 1 second before a response was displayed. The response for the 486 machine was noticeably longer. The response was not displayed for 20 seconds.

2. Software

The server software was chosen after consideration of many factors. Multiple products were reviewed by three groups of students. The server applications that were evaluated were; Internet Information Server (IIS) by Microsoft, Website by O'Reilly and Associates, FastTrack by Netscape Communications and Purveyor.

The criteria used for the evaluation were; Time, Cost, Hardware and Software Constraints, Browser Compatibility, Database Links, Authoring Tools, Features, Scalability, and Administration.

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Time was evaluated on the basis of the complexity of installation and the usefulness of the documentation. Cost included the restrictions on client platforms, licensing, and technical support. Hardware and software constraints included an evaluation of minimum requirements and cross platform compatibility. Browser compatibility was simply an evaluation of which browsers were supported. Links to database evaluated how many different types of databases are supported, whether or not the interface was proprietary, and if the tools are included with the server. Authoring Tools was a basic check to evaluate if an authoring tool was included that would assist developers with HTML page creation and linking to the database. Features evaluated if the package included security, e-mail, ftp, and site searching. Scalability was a check to see if the software had provisions for adding components or capabilities. Administration evaluated whether the site included provisions for logging activity and remote administration capability.

	Microsoft Internet Information Server	O'Reilly Website	Netscape FastTrack	Purveyor
Time				
Cost	**Free with Server**	**$495**	**$295**	**$895**
Hardware & Software Compatibility	**Windows NT Server Only**	**Windows 95, Windows NT Workstation and Server**	**Windows NT Workstation and Server**	**Windows NT Workstation and Server**
Browser Compatibility	**All**	**All**	**All**	**All**
Database Links	**Yes**	**Yes**	**+$295**	**+495.**
Authoring Tools	**Included**	**Included**	**Included**	**Included**
Features	**Embedded FTP**	**Freeware FTP Add-in**	**Freeware FTP Add-in, No S-HTTP**	**Freeware FTP Add-in, No S-HTTP**
Scalability	**Yes**	**Yes**	**Yes**	**Yes**
Administration	**Remote**	**Remote**	**Remote**	**Remote**

	Microsoft Internet Information Server	O'Reilly Website	Netscape FastTrack	Purveyor
	capable	**capable**	**capable**	**capable**

Table 2: Web Server Capabilities[23]

A freeware version of an FTP server was found that works with all the platforms. This removed FTP as a discriminating criterion.

IIS is the fastest server. The researchers were not able to determine that the performance benefit was due to skewed results brought on by the hardware that the tests were run on. The IIS system ran on server hardware consisting of 128 MB RAM and all other web servers ran on client hardware consisting of 32 to 64 MB of RAM.

Even though IIS is a free program (available by FTP from Microsoft and bundled with Windows NT Server), running IIS is the most costly. In order to run IIS one must have Windows NT server installed as the platform OS. IIS will only run in conjunction with the server version of NT. According to terms of the end user license agreement (EULA) separate licenses must be purchased to use NT Server as a webserver.

The basic EULA of Windows NT Server limits connections to the server to one connection. Additional licenses can be purchased on either a per server or a per seat basis. The per server option is a means to purchase licenses for a set number of concurrent

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[23] Test data compiled from: Newman and Fowler, "Web Servers: Digging Into Corporate Data", Data Communications, pp57-68, November 21, 1996, and http://website.ora.com

connections. The per seat license is owned by the connecting user. If per seat licensing is used the client must have a license for each server they will connect to.

The EULA for Windows NT workstation limits the number of connections to ten. The EULA for Windows 95 specifically states that there is no limit to the number of connections if the product is used as a network server.

IIS had the fastest performance scores when working with the database and supported all the listed criteria. IIS is the only package that includes an FTP server capability integrated with the web server.

Netscape FastTrack does not support Windows 95 as a Server OS. FastTrack does not include a database server, although one can be purchased. FastTrack does not include the capability for secure hypertext transport protocol (S-HTTP). FastTrack was the lowest cost of all the Servers evaluated. The key discriminator against FastTrack was the lack of a database connection.

O'Reilly's Website included support for all the evaluation criteria and capabilities. Website is compatible with Windows 95 and all versions of Windows NT. The cost for Website was equal to the average cost of all the packages evaluated.

Netscape and Purveyor were eliminated from the selection process because Website met or exceeded them in all categories. Microsoft Internet Information Server was not selected because IIS will only run with Windows NT Server. The research involved developing a prototype that would integrate easily into the department selected for analysis.

Eliminating IIS because the program requires Windows NT Server may seem overly constraining. One can argue that the user interface is the same for Windows 95 and

Windows NT version 4.0. One of the prototype design goals was to develop a system that can run on as many platforms as possible. Additionally, this decision was made to avoid some of the administration overhead associated with the server version of NT and to capitalize on the permissive nature of Windows 95.

Permitting Windows 95 as a target system allows for lower deployment costs. Also, by design, Windows 95 is more tolerant of older applications. This will allow many of the legacy applications to continue to be used. Additionally the increased cost of Windows NT Server and additional licenses to allow multiple client access to the web server increased the cost of the Windows Server and IIS package well beyond the cost of Windows and O'Reilly Website.

C. USEFUL RESOURCES

Directed study in Webserver installation, operation and maintenance was very helpful in developing skills necessary for development of WWW interfaces for information sharing. Understanding the capabilities and limitations of the various web server applications was invaluable.

Additional exercises and directed readings in WWW based content development and implementation tips and techniques also helps in design. Information on articles and resources is contained in the bibliography.

The following resources are particularly helpful for developing concept and vision for an Intranet project.

Levitt, Lee, "Intranets: Internet Technologies Deployed Behind the Firewall for Corporate Productivity", prepared for Internet Society INET'96 Annual Meeting (URL http://www.process.com/intranets/wp2.htp, 1996).

PC Week Magazine maintains an Archive of articles and case studies pertaining to Intranets. http://www8.zdnet.com/pcweek/builder/ibpast.html

An article on ROI and cost benefit analysis of Intranets can be found at: http://www.cio.com/WebMastera/040197_roi.html

V. IMPLEMENTATION ISSUES

A. COST

Implementation of an Intranet to support administrative functions in the department requires the purchase of webserver software. Additionally it is recommended that hardware also be purchased to serve as a server. Discussion of actual costs is used to illustrate expected costs and to serve for planning purposes. The reader should keep in mind that the goal was to develop a thesis to demonstrate Intranet capabilities, not propose a target configuration or components. The prices are for actual products and are current at the time the thesis is written. As shown in Chapter IV, most of the available software is priced within a range of $50 of any competing product.

As stated in Chapter IV, the required software is a Webserver and an ODBC database server. The commercial, off the shelf, cost for the Webserver used for this prototype is $495. There are two versions of the ODBC available commercially. The workgroup edition ($495) supports databases built with Microsoft Access, Microsoft Foxpro, Borland Paradox, and Borland dBase. The professional edition ($995) supports all ODBC databases.

The only costs associated with training will be the wages or salary of the individual receiving the training. There is no cost for the actual training since one of the authors will be available conduct the training. It is recommended that consideration be given to allow independent study or directed study credit be given to the trainer, so that time can be allowed in his academic program.

B. TRAINING

As stated, training can be conducted by one of the authors. This is possible because one of the Authors will remain as a student at NPS for two quarters after this thesis is completed.

Having the student available after thesis competition and implementation of the system allows that student to provide support for implementation and further refinement of the user interface.

It would be impractical to have regularly scheduled training for students since there is a constant rotation of the student body. A more feasible approach is to develop a user manual designed for students that discusses the security aspects and capabilities of the Department Intranet.

On the other hand current faculty and staff can be offered a one-time training period. Providing opportunity to the faculty and staff will help the system be accepted in the department. The administrator, as needed can conduct training of new personnel. However, a more efficient, informal training by peers will probably become the norm as individuals will strive to minimize the time needed away from their primary responsibilities.

The system administrator will need more extensive training. Depending on the experience and skills of the individual, training in HTML and database management may be necessary. At a minimum, the system administrator will need training in the security and operation aspects of the specific Webserver software.

C. SECURITY

Security is best understood by understanding the types of users and what information they will need to access. The types of users for this system are Students, Faculty, Staff, Department Administration, and the system administrator.

There are only a few areas that have information relevant to students. Students have a need for administrative contact information about Faculty, such as office and email address. Students also may be interested in what classes are offered in a particular quarter and what texts have been requested. Also, students will use the system to submit SOF input.

Faculty information needs are similar to students and include a few others. Faculty will also use the system to complete course journals and requisition textbooks. Faculty will also receive SOF information through email generated by the system.

Department staff will have a need for some of the faculty contact information. Additionally the staff will use the system for viewing departmental news and messages that are not distributed using email or other means.

Department administrators will access SOF reports as well as the information used by the other classes of users. As a business rule, department administration should be prevented by viewing confidential SOF comments between students and instructors.

As stated, the system administrator will need to have access to all the information. This is necessary for the performance of maintenance and for some other administrator tasks, such as dispatching SOF comments to instructors when directed.

An important security feature that should be used is logging. NPS computer security rules require logging by all machines that can be accessed by or allow access to

the campus networks. Logging involves the automatic recording of who access the system. The existence of logs is important if information needs to be restored or breeches need to be investigated. The log provides a means of identifying what users or office accessed what portion of the system.

In addition to assigning users to different classes, as allowed by the webserver, files should be segregated within the file structure for the server. Setting up a directory structure that groups related HTML pages and content allows the administrator to assign permissions and manage security each file directory. This security scheme will facilitate the publishing of information. For example, newsletters and messages can be stored together in a relatively accessible directory. This allows the creator of the information to publish directly to the server with minimal input from the administrator. Conversely, items such the database and SOF comments should be in secured directories so the integrity of the information can be insured.

D. DATABASE POPULATION

There are two methods of getting information into the database. The first method is to allocate a person or group of persons to the task and have them type in relevant information, such as classes, instructors and newsletters. After the initial information is input, as the system is used information will remain current. The second method is to operate the Intranet in parallel with the current manual system, until such a point that the database has caught up with the manual system. Even with this method, a certain amount of raw data that does not change on a frequent basis will need to be input into the database.

Some data can be imported directly from the prototype. The faculty information contained in the prototype database is actual and current. No SOF information needs to be input, since the information is new every quarter. As the system is used the SOF protion of the database will grow and provide more information on trends, as more historical information is available.

E. DATABASE ADMINISTRATION

The system administrator should be given responsibility and ownership of the database. Due to limitations imposed by linking to the data through an ODBC server, access to pages that change or to the actual datafiles should be restricted.

In order to change the data in the database, requests should be sent to the administrator. HTML pages have been built in the prototype that demonstrate the ability to modify records from the browser window.

One feature demonstrated in the prototype is the ability to notify individuals of changes to information. As a change is committed, the webserver will send a message that shows what information was changed. This feature was implemented as a means of checking the accuracy of information. If the user receives verification e-mail, then the e-mail address on file is correct, if not, the administrator will receive a message from the e-mail daemon, this is an indication that the e-mail address is incorrect. Upon receipt of the e-mail, the user has the responsibility of verifying the information.

As stated earlier, newsletters or information for all users can be published to the Intranet directly from the originator. Most word processors include the ability to save a document as an HTML document. Additionally, ASCII text documents can be viewed from any WWW browser.

VI. SUMMARY

A. PROJECT CONCLUSIONS

1. Intranets vs. Internets

Basically an Intranet is a collection of technologies that are common to the Internet to publish and share information within an organization amongst organization employees rather than sharing or providing information to the general public. What distinguishes an Intranet from an Internet is the application itself. Intranets are personable and are developed and used for and within organizations. Intranets focus on employees. By design they are process oriented, provide an environment for employees to streamline how work is done and how to expedite the creative and developmental processes.[24] Internets on the other hand are not personable, rather they are designed for a specific group of users, but public information.[25] Internets focus primarily on company profiles and product orientation, making them an excellent source for educational research for their intended audience, the consumer, the customer, and the student.[26]

2. The Prototype System as a Development Tool

Prototypes are playing an increasing role in product and process design.[27] Rapid prototyping can help in saving time and money. It serves as a tool for user change and allows for the delivery of a workable system as an end product. The significance in

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[24] Hinrichs, Randy J., Intranets: What's the Bottom Line?, Prentice Hall Computer Books, p. 33, June 1997.

[25] Ibid. p. 34.

[26] Ibid. p. 32.

[27] Colton, Jonathan, Eastman, C., Graver, T., Ku, D., Kurfess, T., McGinnis, L., Farrokh, M., Muzzy, J., Rosen, D., Schwerzel, R., and Starr, T., "Rapid Prototyping and Manufacturing at Georgia, Tech", white paper, p. 2., 28 June 1996.

contributions to cost/time reduction and functional improvement in the product realization process as it applies to information technology management, is really no different than developing the physical artifact for a manufacturing process.[28] The resulting Intranet product is useful for visualization, interference checking, and functional testing.[29] Prototypes being developed with today's technology are workable, useable, and fully functional systems. It does not make sense any longer to spend the necessary time and money in developing a rapid prototype, only to throw it away. Intranet prototypes can be placed in the same category as other physical developmental products; they can be immediately used after development and testing.

3. The IDM Tool

This thesis has been an excellent candidate in demonstrating and proving that the traditional systems development lifecycle (SDLC) process is now obsolete. The modified IDM methodology for development of this prototype provided a means to work in manageable modules, build a rapid prototype, modify the prototype when needed through continuous testing, and to stress the user interface, which are all key characteristics of building rapid prototypes.[30] This methodology proved specific enough to analyze this topic, but is easily adaptable and can be applied to any system analysis problem.

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[28] Ibid., p. 2.

[29] Ibid., p. 3.

[30] Kenndall, Kenneth E. and J.E. Kenndall, Systems Analysis and Design, 3rd edition, p. 214, Prentice Hall, Englewood Cliffs, New Jersey, 1995

B. AREAS FOR FURTHER RESEARCH

1. Limitations of and Enhancements to the Prototype

Security will continually be an issue. Remote user initial login is not physically present in the prototype. Users do not have the capability to access and request a login and password. Users must be manually entered into the database, through the use of Intranet based forms by the administrator.

Another issue is limiting the number of SOFs that a student can access. If a student wanted to fill out several SOFs for one class, he/she could do so. This is not to say that the administrator could not limit the number of SOF forms being distributed per class. This could be accomplished through software. The ultimate problem is limiting accessibility to one form per student, while at the same time providing anonymity. Software fixes for this limitation were not available at the time this research was conducted. Future technology enhancements lie in integrating other technologies such as JAVA and/or Active-X into a user database. A more current release of Website has the capability to link with the actual NT server for access, and again, was not available at the time this prototype was being built.

The SMIDSS prototype will enhance the daily business activities within the Department of Systems Management and continue maturity through use. The online browser format allows easy access by any user. The Education Technician can easily perform any job functions directly from the desktop, as opposed to being away from the desk obtaining paperwork from departmental staff. Constant use of the prototype promotes continuous and iterative change through user feedback. Users will have the

ability to contact the Administrator to suggest any changes or enhancements, thereby fulfilling one of the goals of the IDM process, constant improvement.

2. Campus Wide Implementation Issues

A fundamental issue for this prototype is scaling it to fit the needs of each department at NPS. Although not an issue that will plague migration, each department has its uniqueness. The use of the modified IDM process in conducting systems design and analysis yielded such detailed research, that modifying processes will be an easy task for further researchers.

Security for the Intranet must be focused on the confidentiality of the SOFs. Policies will have to be developed defining acceptable use and communicating security to users. Pending campus-wide implementation, a standard security protocol will have to be developed to ensure uncompromising success in maintaining anonymity.

Connectivity to the registrar's office offers another hurdle to future researchers. Software rather than hardware connectivity is the problem. Currently, there is not a foreseeable fix to developing a fully automated scheduling process, therefore, a standard campus-wide database management system must be implemented. A database would allow mass storage of classes, faculty and students, which can be easily maintained and manipulated. Although not an algorithm for the scheduling process, this system would allow each department access to needed information and provides a standard for software connectivity.

SMIDDS was extensively tested for implementation within the confines of a single department. Further research into a testing methodology suitable for larger scale

projects (campus-wide) to include concurrent access, must be pursued to understand and fully document limitations on servers, ODBC serves, and various hardware components.

3. Migration to Military Applications

Since late 1996, the Department of Defense has been making strides to move away from ARPAnet to the Intranet in linking legacy Internet and Intranet applications.[31] Intranets are proving their worth because of open standards-base protocols, thereby preserving already existing hardware and software applications. The military as a whole must understand the feasibility of developing Intranets for its daily use. No longer is this tool simply connecting technology with software, but serves as an intelligence tool. Putting organizations on Intranets allows one to leverage the intelligence of that organization.[32] Downsizing the military only strains organizations. Military service members are asked to do and know more with fewer resources. Intranets in the business world can be applied to the military by providing a means to define, so that people can focus more clearly on what their own contributions are to the organization.[33]

The cost savings realized through Intranets will come in the form of time. Specifically, this is time taken from wartime training and missions spent on administrative and decision making functions. Intranets will allow sharing, managing, and publishing information, as well as, decision making from any desktop by linking all information within an organization. The focus of the military services must be to realize

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[31] Barksdale, J., "From ARPAnet to Intranet: The U.S. Government and Internet Technologies", http://home.fr.netscape.com/comprod/columns/mainthing/governmental.html, Netscape Communication Corporation, 28 September 1996.

[32] Hinrichs, Randy J., Intranets: What's the Bottom Line?, Prentice Hall Computer Books, p. 15, June 1997

the potential of Intranets. Recognizing this investment will lend itself to getting usable information in the hands of the lowest ranking military service member (empowered individual). This will make service members more efficient and knowledgeable in the operations of an organization and ultimately provide increased time to conduct wartime training and missions in an era when time is a commodity.

Developing this prototype proves that this technology can be easily migrated to similar military applications. The hardware and software are in place in most organizations, as well as, the network connectivity. Most, if not all, military organizations are using email to communicate. These organizations are no different than commercial businesses in respect to the need for information and the ability to control and use it. However, the limiting factor in military organizations is expertise to migrate these technologies into the work place. There are not any Information Officer billets or positions in place within military organizations below Division level with respect to the Army and similar organizations in the sister services.

The benefits of an Intranet to military organizations are enormous. Online training through video and scheduling can be conducted from the desktop. The Intranet can be a learning system to trainers and supervisors as they look to other organizations to tap into experts and points of contact to provide information. It is a knowledge base system for leaders and supervisors to make timely and informed decisions.

As the military moves toward further decentralization of its units, empowerment of individuals becomes an issue and a goal. Intranets are an empowering tool. Being able

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[33] Ibid., pp. 152-153.

to build and distribute information online is efficient empowerment.[34] Although sharing

information is a risk, service members cannot possibly be responsible for improving their

processes, improving workflow, and collaborating with the right people without the

needed information. One of the risks in sharing information is the responsibility and

accountability for the integrity of the data. Another aspect is ensuring that the information

is only accessible by authorized personnel. Perhaps the greatest benefit will be for those

in the lower ranks. When a commander publishes a vision, values, objectives and goals

they enhance trust and provide personnel with direction.

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[34] Ibid., p. 159.

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APPENDIX A – DATAFLOW DIAGRAMS
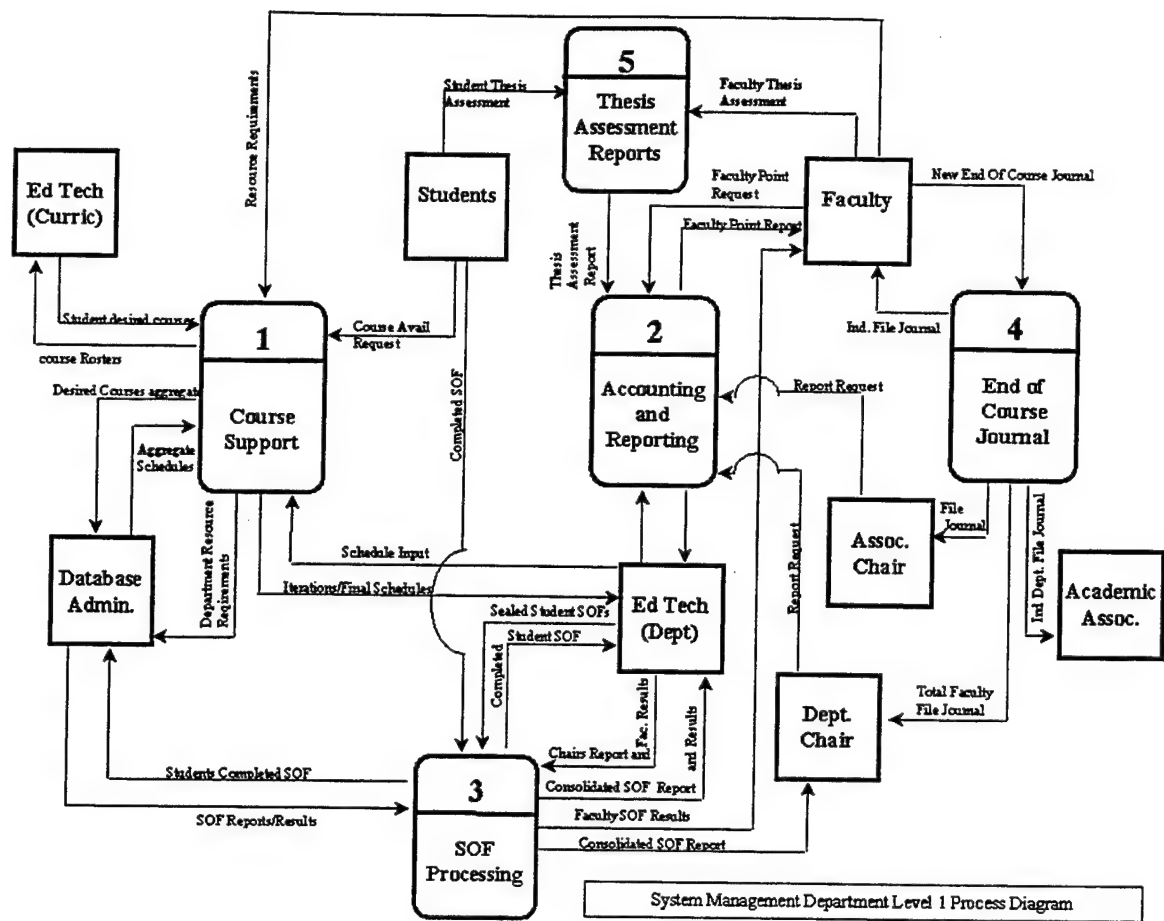
Figure A-1: Level 1 Process Diagram
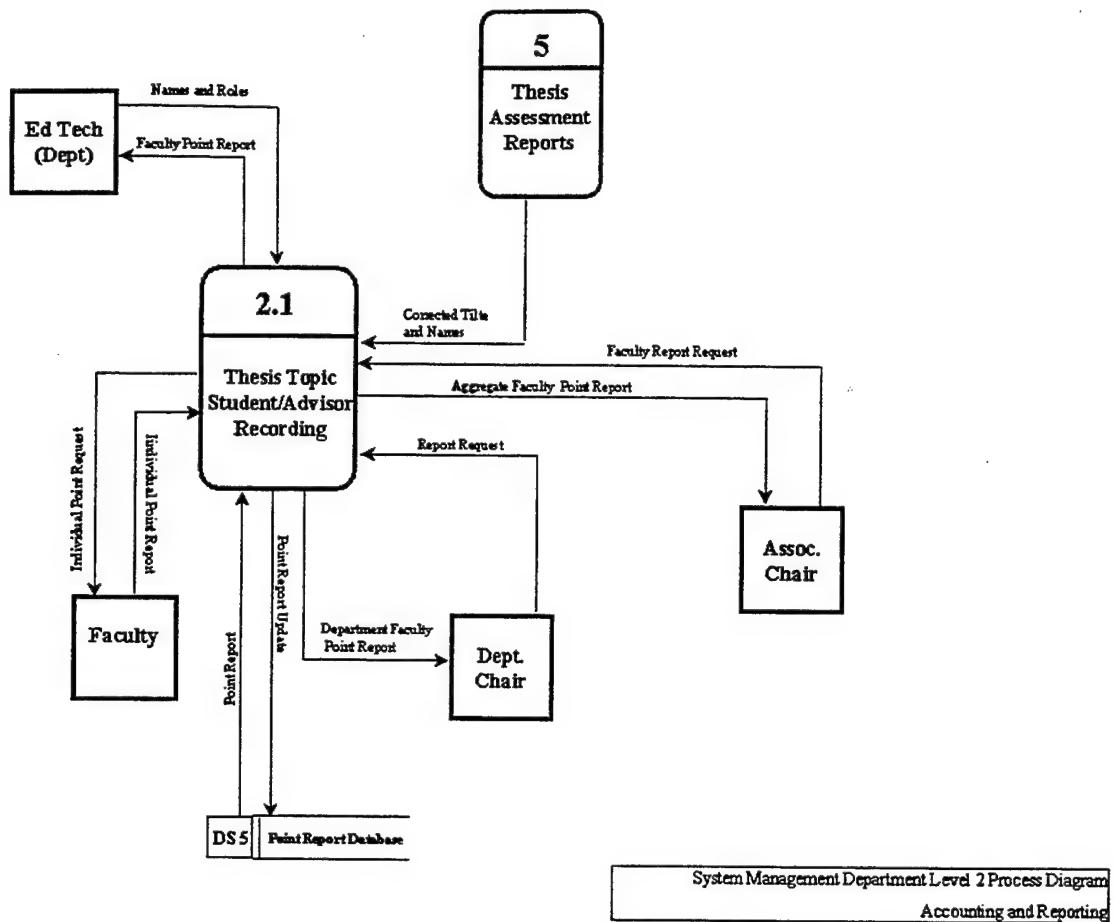
Figure A-2: Level 2 Process Diagram
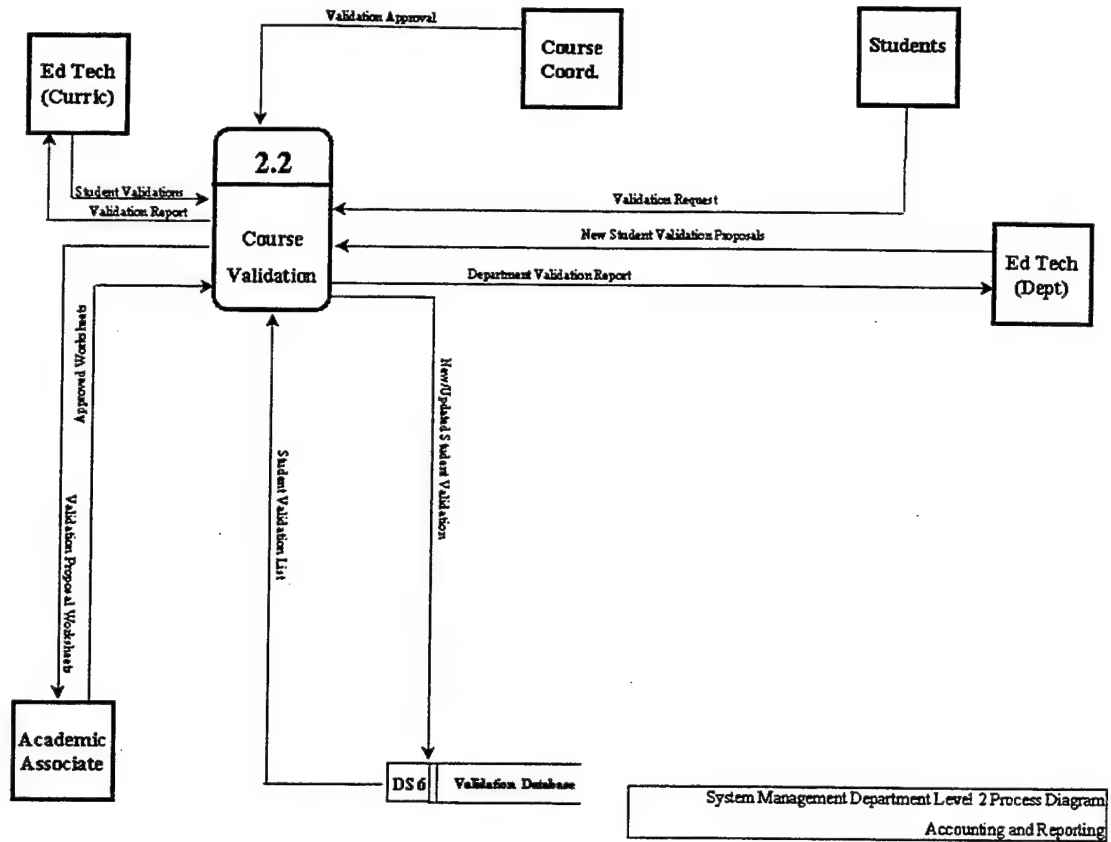
Figure A-3: Level 2 Process Diagram
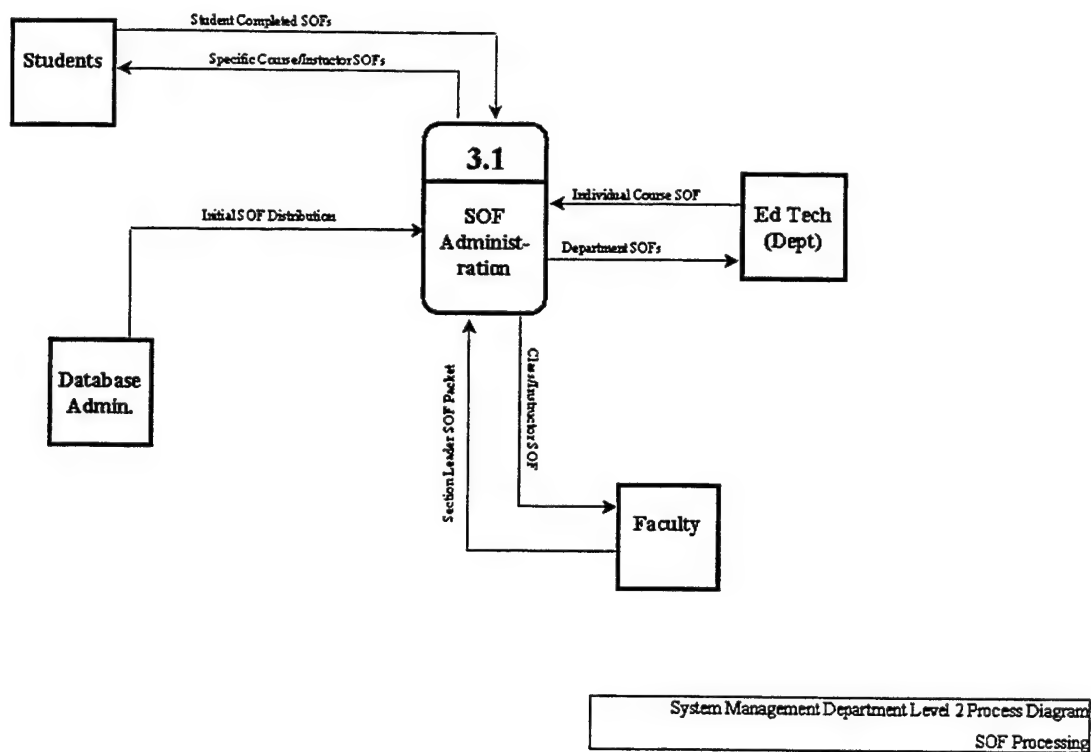
Figure A-4: Level 2 Process Diagram
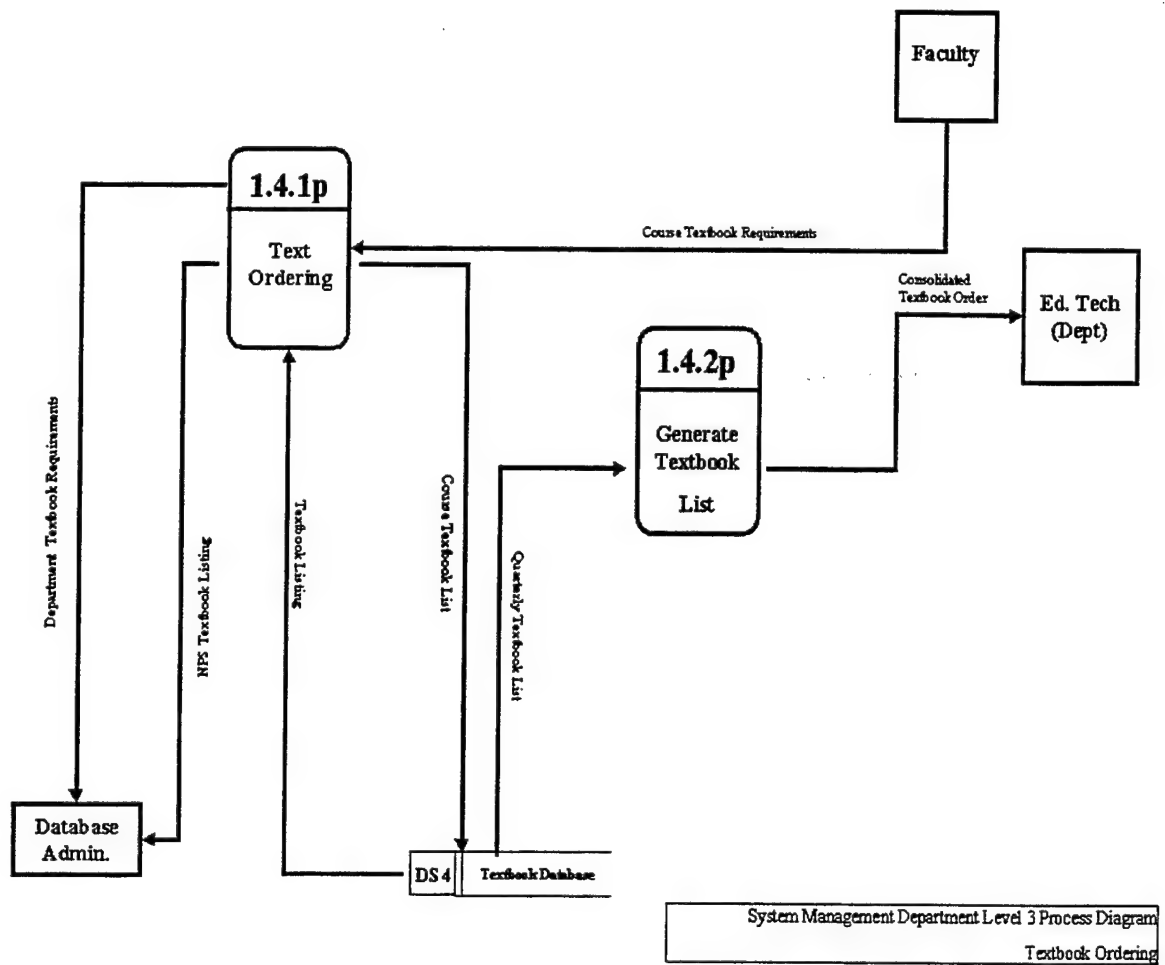
Figure A-5: Level 3 Process Diagram
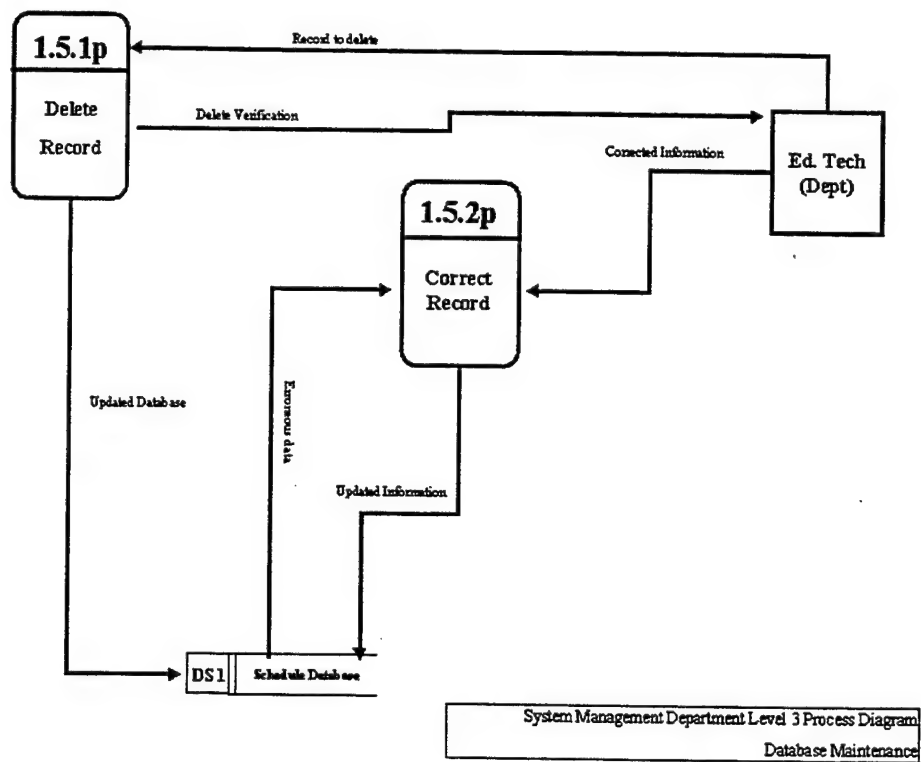
Figure A-6: Level 3 Process Diagram

APPENDIX B - SAMPLE FORMS AND REPORTS

NAVAL POSTGRADUATE SCHOOL
Monterey, CA 93943-5000

NPS(SM/FA)
_____ 95

MEMORANDUM

From: Chairman, Department of Systems Management
To: Curricular Officers/Academic Associates
       Department Chairman

Subj: COURSE OFFERINGS, _____ QUARTER 1996

1. The following courses **will** be offered by the Department of
Systems Management for the _____ quarter (beginning Monday, ___
_____ 1996):

2. The following courses **will not** be offered during the _____
quarter:

                        GAIL FANN THOMAS
                        Associate Chair for Instruction
                        Systems Management Department

Dist: Codes 30, 31, 32, 33, 34, 35, 36, 37, 38, 39
       Codes CS, MA, SM/Js, SM/Et, SM/Ev, SM/Fa, SM/Hc,
       SM/Hr, SM/Lt, SM/Mo, SM/Mp, SM/Sa, SM/Th, OR, NS, PH, EC,
       MR, AA, OC, ME, AW, SP, EW, CC

Figure B-1: Course Offering Memorandum

MEMORANDUM

From: Gail Thomas, Associate Chair for Instruction
To:

Subj: TEACHING ASSIGNMENT FOR _____ QUARTER, AY 1997

1. During the coming _____ Quarter, you are scheduled to teach the following course(s):

Course Number	Credit Hours	Tentative Enrollment	Segments

Please coordinate your textbook selection with _____ _____, who will also be teaching the course.

2. Do you want 1 or 2-hour class meetings for ...

_____   1 hour _____   2 hours _____

_____   1 hour _____   2 hours _____

3. Do you need a scheduled final exam for ...

_____   Yes _____   No _____

_____   Yes _____   No _____

IF UNSCHEDULED EXAM, WHAT IS YOUR SUBSTITUTE?

_____

_____

_____

4. Please indicate any specific classroom requirements by course number below.

COURSE NO.	CLASSROOM REQUIREMENTS
_____	_____
_____	_____
_____	_____

Figure B-2: Teaching Assignment Memo - Page 1

5. Please give specific reasons to justify schedule requirements. When listing requirements, it is important that you specify the days/times that you CANNOT teach.

_____

_____

_____

_____

6. LAB SESSIONS USING I-158, I-224, I-250, OR I-364E MUST BE ASSIGNED THROUGH THE SCHEDULER. PLEASE INCLUDE ANY SUCH REQUIREMENTS BELOW AS WELL.

I-158	I-224	I-250	I-364E
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

7. What software do you want available in the Labs? (Please do not list software that is already installed.) For reference, a list of currently installed software is posted outside each lab.

_____

_____

Do we have the software that you have requested above? Yes/No

8. TEXTBOOK ORDER FORMS

Attached is a textbook order form for each course listed above. Please return this order form to Lynn Boyle, even if you are not ordering any textbooks. Be sure to show the ISBN number for each text ordered and the exact edition you want if not the latest out on the market. The Bookstore will not accept the order without it. NOTE: The bookstore will no longer order optional textbooks without a list of student names submitted. This usually can't be done until classes have started. PLEASE PRINT YOUR NAME ON THE TEXTBOOK ORDER FORM.

9. RETURN BOTH OF THESE FORMS TO LYNN BOYLE NO LATER THAN 4:00 P.M. Monday, 29 April 1996.

GAIL FANN THOMAS

Figure B-3: Teaching Assignment Memo - Page 2

LIST OF PREFERENCES/REQUIREMENTS - WINTER 1997

31 OCT 96

FACULTY	PREFERENCES	REQUIREMENTS
Prof. Ramesh		IS 3020 (3-2) - Wants 2+2+1 hour classes and a classroom for all these hours. Some of the one 2-hour slots will meet in the lab.
		Mon/Tues/Wed or Tues/Wed/Thurs
		Wants I-250 (2 hours per week)
Prof. Schneidewind	Mon/Tues/Wed	Must have the following sequence: 2-hour lecture; 2-hour lab; 1-hour lecture.
		0810 classes o.k. Wants I-325 for lectures.
		Wants I-224 for the lab.
LCDR Brinkley		IS 3504 - 17 students max per section.
		Wants I-224 for the lab.
Prof. Buddenberg	Prefers 2-hour class on Tues a.m. Mon is not impossible but not good 1-hour class anytime	Needs I-271 due to the number of students and new network capabilities in the classroom. 1 (2-hour class) 1 (1-hour class)
Prof. Haga		Wants both segments on the same days. Wants I-381 for both segments.

Figure B-4: Faculty Scheduling Preference Worksheet

TEXTBOOK REQUISITION
NAVY EXCHANGE BOOKSTORE-MS4
FOR TERM: _____

DEPT: _____
COURSE: _____

INSTRUCTOR'S NAME: _____ PHONE EXT: _____
SECTION NUMBER(S): _____
THIS TERM'S ANTICIPATED ENROLLMENT: _____

****
Enter new adoptions below:

AUTHOR	TITLE	B	ISBN	ED/YR	PUBL	REQ	OPT

SPECIAL NOTES:

INSTRUCTOR'S SIGNATURE _____ DATE
DEPARTMENT CHAIR'S SIGNATURE _____ DATE

10:53:32 07 OCT 1996

Figure B-5: Textbook Requisition Form

MEMORANDUM

To: All SM Faculty Teaching During Winter Quarter
From: Gail Thomas, Associate Chair for Instruction
Subj: SUBMISSION OF Winter 1995 COURSE JOURNALS/THESIS QUALITY ASSESSMENT FORMS

1.   For those who taught during the Winter, please submit your completed course journals as soon as possible. If you did not change your course since a previous complete journal submission, just complete a new cover sheet indicating grade distribution for Winter quarter and reference the prior course journal in the comments section.

2.   Additionally, Thesis Quality Assessment forms for Winter quarter graduating students are being distributed for your completion to all thesis advisors (if you need more forms, see Lynn). Please submit your assessment questionnaire(s) to Lynn as soon as completed. Thanks.

                        GAIL FANN THOMAS

Figure B-6: Course Journal Instruction Memo

MEMORANDUM

FROM: Gail Thomas, Associate Chair for Instruction (Code SM/Fa)
TO: 1~

Subj: RETURN OF THE THESIS QUALITY ASSESSMENT SURVEY FORMS

1. Please return the completed Thesis Quality Assessment Survey Forms for the student theses listed below. To compile the results, we would like the forms returned to us by COB **12 July 1996**.

2. The student theses listed below are what we currently show in the database. If you find any discrepancies (student names, role, or graduation date), please correct. In any case, return the memo to Lynn.

3. Your cooperation in this matter will be greatly appreciated.

GAIL FANN THOMAS

Faculty	Advisor	Student	Curriculum	Grad Qtr
1~	2~	3~	4~	5~

TP = Principal Advisor
TC = Co-Advisor
TA = Associate Advisor

Figure B-7: Thesis Quality Assessment Transmittal Memo

SYSTEMS MANAGEMENT DEPARTMENT

THESIS QUALITY:
ADVISORS' ASSESSMENT

As part of our efforts to get better information on how we're doing in our core instructional activities, we are initiating a simple assessment effort focused on assessing the "quality" of our students' theses. To that end, we're asking each "advisor" (principal advisor, co-advisor, associate advisor) to complete the following brief questionnaire on each thesis that he or she signs. The purpose of the questionnaire is to provide all of us (Systems Management faculty) with a more complete picture of what we think about the value of the theses we are involved with. Our collective views should be interesting, at the least, and more importantly, indicate how we're doing and suggest where and how we can improve in making the thesis a valuable educational experience that contributes to both our students' future career success and helps DoD more effectively address its current and anticipated challenges.

The questionnaire asks your views about the quality and value of the written thesis product. (In a separate questionnaire, we're also asking students to share their views of value of the thesis experience and the extent to which they feel that we—their faculty advisors—have been helpful in assisting them in completing their theses).

As you'll see, the questionnaire is very brief and easy to complete, so it shouldn't take much of your time.

One final point concerning how the information will be used. Gail Thomas will provide quarterly feedback to the faculty, in aggregate form, based on all advisors' responses. We do not intend to provide any individual faculty feedback, so if you're interested in your own assessments, please make copies of your completed questionnaires before turning them in.

We appreciate your effort and support in helping all of us to improve the quality of our programs and enhancing the value of future students' experience at NPS. Thank you.

The completed questionnaires should be turned in to Lynn as soon as possible after you sign off on your student's thesis. If you need additional questionnaires or have any questions, see Gail.

Figure B-8: Thesis Quality Assessment - Advisor's Instructions

THESIS QUALITY ASSESSMENT   Grad Date

Student's Name _____

Your Name: _____   Your Role: Principal Advisor ___ Co-advisor ___ Assoc Advisor ___

Student's
Curriculum ☐   ☐   ☐   ☐   ☐   ☐   ☐   ☐   ☐   ☐   ☐   ____ (write curriculum
(check one) 813   814   815   816   817   819   820   827   837   847   370   Other number)

Student's
Service:
(check one) ‾‾‾‾   ‾‾‾‾   ‾‾‾‾   ‾‾‾‾   ‾‾‾‾   ‾‾‾‾   ‾‾‾‾
             Navy   Marines   Army   Air Force   Coast Guard   Allied Officer   Civilian

The following questions seek your assessment concerning the quality of the theses you that you have advised. For each statement, please check the box that most accurately reflects your assessment of the written thesis product.

	Strongly agree	Agree	Disagree	Strongly disagree	No opinion
1. The written document demonstrates a solid knowledge of relevant theory and conceptual issues appropriate to thesis topic.	☐	☐	☐	☐	☐
2. The written document demonstrates sound understanding of relevant theory and conceptual issues appropriate to focal topic.	☐	☐	☐	☐	☐
3. The written document demonstrates competent application of core skills and techniques relevant to focal topic.	☐	☐	☐	☐	☐
4. Thesis is well written; demonstrates competent writing and communication skills.	☐	☐	☐	☐	☐
5. The written document addresses a problem, challenge, or issue that is important and relevant to current and/or future DoD interests.	☐	☐	☐	☐	☐
6. The written document satisfies the criteria for good academic quality research.	☐	☐	☐	☐	☐
7. Thesis will enhance the positive image of NPS in the eyes of important DoD decision makers.	☐	☐	☐	☐	☐
8. Thesis is of publishable quality. A shortened version should be (is) submitted to appropriate journal or magazine for publication.	☐	☐	☐	☐	☐
9. As advisor, I'm proud to have my signature on this thesis.	☐	☐	☐	☐	☐

THANK YOU

Figure B-9: Thesis Quality Assessment - Advisor's Questionaire

SYSTEMS MANAGEMENT DEPARTMENT

STUDENTS' THESIS EXPERIENCE:
AN ASSESSMENT

The Systems Management faculty is interested in knowing more about your thesis experience in order to improve the value of the experience to both students and DoD. The following brief questionnaire will provide us with feedback about your experience with your thesis advisors and your assessments of the value of the thesis as a learning experience. We ask about your experiences in carrying out your thesis research, producing the final writing product, and especially, the role that your advisors played in getting you to this point.

One important point; in the questionnaire, we ask you about your "advisor(s)." By "advisor," we mean all of the faculty "advisors" who must sign your final product: your principal advisor or your "co-advisors," and/or your "associate advisor." Please fill out a questionnaire on each "advisor."

As you'll see, the questionnaire is very brief and easy to complete, so it shouldn't take much of your time. Nonetheless, despite the brevity of questionnaire, the information you provide is important and will definitely be informative to the faculty.

One final point concerning how the information will be used. The total faculty will receive feedback, in aggregate form, based on all of the students' responses. However, we also want to be able to give individual faculty the feedback from those students that they advised. So we will provide anonymous feedback to the advisors only after you have graduated. Be assured that we have no desire to identify specific student names with any questionnaire, although we would encourage you to share your views with your advisor(s). The Associate Chairman for Instruction will provide feedback to the faculty, collectively and individually.

We appreciate your effort and support in helping us improve future students' experience at NPS. Thank you.

The completed questionnaires should be turned in to the Department Chairman's secretary in I-230 when you bring your completed thesis for the Chairman's signature.

Figure B-10: Thesis Quality Assessment - Student's Instructions

THESIS ADVISING AND THESIS QUALITY ASSESSMENT   Grad Date

Advisor's Name: _____   Principal Advisor ___ Co-advisor ___ Assoc Advisor ___

Your
Curriculum   ☐   ☐   ☐   ☐   ☐   ☐   ☐   ☐   ☐   ☐   ☐   ___   (write
(check one)   813   814   815   816   817   819   820   827   837   847   370   Other   curriculum
                                                                                            number)

Your Service: ___   ___   ___   ___   ___   ___   ___
(check one)   Navy   Marines   Army   Air Force   Coast Guard   Allied Officer   Civilian

The following eleven questions ask your views about your thesis advisor(s) and how they contributed to your learning and
assisted you in completing your thesis. For each statement, please check the box that most accurately reflects your
response. Please complete a separate questionnaire for each of your thesis advisors/readers.

	Strongly agree	Agree	Disagree	Strongly disagree	No opinion
1. My advisor was available to provide help and guidance in completing my thesis project.	☐	☐	☐	☐	☐
2. My advisor provided significant assistance in conceptualizing the problem that my thesis addressed.	☐	☐	☐	☐	☐
3. My advisor was helpful in guiding me through the data collection and analysis stages of my work.	☐	☐	☐	☐	☐
4. My advisor was helpful in guiding me through the writing and editing phases of my thesis.	☐	☐	☐	☐	☐
5. My advisor was helpful in getting me to see the relevance and importance of my results to DoN/DoD.	☐	☐	☐	☐	☐
6. I feel that my thesis is a quality product and represents some of my very best work to date.	☐	☐	☐	☐	☐
7. The thesis was an opportunity for me to apply the knowledge and skills I acquired at NPS.	☐	☐	☐	☐	☐
8. Without hesitation, I would recommend my advisor to my fellow students who want to do a superior thesis.	☐	☐	☐	☐	☐
9. As a result of doing my thesis, I now feel confident about my ability to do quality research and/or analyses.	☐	☐	☐	☐	☐
10. I am truly proud of my thesis research product.	☐	☐	☐	☐	☐
11. Overall, the thesis project was a valuable learning experience.	☐	☐	☐	☐	☐

THANK YOU AND BEST OF LUCK IN YOUR FUTURE ASSIGNMENTS.

Figure B-11: Thesis Quality Assessment - Student's Questionaire

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VALIDATION PROCESS

31 MAR 97

Student Name:
Curric #: 370
Input Date: **JULY 1997**

Academic Associates Recommendations	Course #	Course Coordinator	Concur		Process					Class Replacement
			Yes	No	Transcripts	Interviews	Exam	Exam Results		
								Pass	Fail	
	IS 2000	Doug Brinkley								
	IS 3170	Bill Gates								
	MN 2155	Doug Moses								
	MN 3105	Ken Thomas								
	OS 3004	Alan McMasters								
	OS 3105	Alan McMasters								

PLEASE RETURN FORMS TO <u>LYNN BOYLE</u> AFTER THE VALIDATION PROCESS HAS BEEN COMPLETED.

Figure B-12: Validation Worksheet

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SOF INSTRUCTIONS FOR INSTRUCTORS AND SECTION LEADERS

Please read Statement of Purpose to Students

STATEMENT OF PURPOSE: Student Opinion Forms (SOFs) serve two purposes. The numerical answers to the questions on the front of the form are used by the Department Chairman and the Administration in evaluating the instructor for pay, promotion, tenure and awards. The instructor uses these answers along with the written comments on the back of the form for improving the course materials and instruction methods. The written comments are seen only by the instructor. Objective: individual responses on the SOFs permit useful evaluation of both the instruction and the course.

INSTRUCTIONS TO THE INSTRUCTOR:

(a)   Completely fill out the course and instructor data sheet provided with the SOFs.

(b)   During class in the 11th week of the quarter, read aloud the above Statement of Purpose and provide class time for the completion of the forms by the students. Do not elicit any specific responses from the students.

(c)   Identify the Section Leader or Senior Officer student to be in charge of collecting the forms and returning them **sealed in the envelope provided** to the Department Secretary or Admin Support Assistant (ASA). Indicate his/her name in section 4 of Cover Sheet.

(d)   Hand out the forms and ask each student to enter the SOF Report Number assigned to this course as indicated on the instructor cover sheet.

INSTRUCTIONS TO SECTION LEADER OR SENIOR OFFICER:

(a)   Forms are to be filled out individually; no student should suggest particular responses to other students.

(b)   Upon completion of the forms by students, collect the forms and enter a three digit sequence number (right-justified, beginning with 001) into the Sub-SOF number part of each form. This should be done in such a way as to preserve the anonymity of the individual student.

(c)   Place all completed forms, in numerical order, together with the Cover Sheet in the envelope provided by the instructor. **Be sure to seal the envelope to maintain the confidentiality of these forms.**

(d)   The Section Leader or Senior Officer is **directed to return the sealed envelope with the completed SOFs to the Department's Secretary or ASA as soon as SOFs are completed but **never later than the Wednesday of finals week.** On the outside of the sealed envelope indicate the date SOFs were administered.

**NOTE: A written report addressed to the Associate Provost for Instruction must be prepared if SOFs are not administered or submission cannot be accomplished by Wednesday of finals week.

** New Items

REV 6/96

Figure B-13: SOF Instructions

STUDENT OPINION FORM
NPS 5040/2 (REV 3-84)

COURSE NO. _____ SEGMENT _____

INSTRUCTOR NAME _____

PLEASE USE SOFT BLACK PENCIL ONLY – DO NOT USE INK.   EXAMPLES: Proper Mark / Improper Marks

REPORT NO. — SUB-S.O.F. No. / S.O.F. No. — CUR-SPECIALTY NUMBER — HRS THIS QTR — QTRS COMPT'D

FOR ME THIS COURSE IS:
REQUIRED ..... ①
ELECTIVE ...... ⑩

Scale headers: STRONGLY AGREE / AGREE / NO STRONG OPINION / DISAGREE / STRONGLY DISAGREE / NO COMMENT

1. The course was well organized .... ⑤ ④ ③ ② ① ⓪
2. Time in class was spent effectively .... ⑤ ④ ③ ② ① ⓪
3. The instructor seemed to know when students didn't understand the material .... ⑤ ④ ③ ② ① ⓪
4. Difficult concepts were made understandable .... ⑤ ④ ③ ② ① ⓪
5. I had confidence in the instructor's knowledge of the subject .... ⑤ ④ ③ ② ① ⓪
6. I felt free to ask questions .... ⑤ ④ ③ ② ① ⓪
7. The instructor was prepared for class .... ⑤ ④ ③ ② ① ⓪
8. The instructor's objectives for the course have been made clear .... ⑤ ④ ③ ② ① ⓪
9. The instructor made this course a worthwhile learning experience .... ⑤ ④ ③ ② ① ⓪
10. The instructor stimulated my interest in the subject area .... ⑤ ④ ③ ② ① ⓪
11. The instructor cared about student progress and did his share in helping us to learn .... ⑤ ④ ③ ② ① ⓪

PLEASE USE THE FOLLOWING SCALE FOR THE NEXT FIVE ITEMS:
5. Outstanding (Among the top 10%)   2. Fair (In the lowest 30%)
4. Excellent (Among the top 30%)   1. Poor (In the lowest 10%)
3. About Average (Middle 40%)   0. Not Applicable/Don't know/There were none

O E A F P NA

12. Overall, I would rate this instructor .... ⑤ ④ ③ ② ① ⓪
13. Overall, I would rate this course .... ⑤ ④ ③ ② ① ⓪
14. Overall, I would rate the textbook(s) .... ⑤ ④ ③ ② ① ⓪
15. Overall, I would rate the quality of the exams .... ⑤ ④ ③ ② ① ⓪
16. Overall, I would rate the laboratories .... ⑤ ④ ③ ② ① ⓪

FOR THE STUDENT: THIS IS IMPORTANT DATA.
AFTER ALL GRADES HAVE BEEN TURNED IN TO THE REGISTRAR, THE COMMENTS AND A STATISTICAL SUMMARY OF THE INFORMATION FROM THESE FORMS WILL BE RETURNED TO THE INSTRUCTOR FOR COURSE EVALUATION AND TEACHING IMPROVEMENT PURPOSES. THE STATISTICAL SUMMARY WILL ALSO BE USED BY THE ADMINISTRATION FOR EVALUATION OF TEACHING EFFECTIVENESS.
DATA OBTAINED UNDER AUTHORITY OF 5 USC 301.

17. ⑤ ④ ③ ② ① ⓪
18. ⑤ ④ ③ ② ① ⓪
19. ⑤ ④ ③ ② ① ⓪
20. ⑤ ④ ③ ② ① ⓪

* * * PLEASE USE SPACE ON REVERSE SIDE FOR COMMENTS. * * *

SAMPLE

Figure B-14: SOF Form (Front)

109

MAKE NO COMMENTS IN THIS SHADED AREA
WRITING IN THIS SHADED AREA WILL CAUSE
ERRORS BECAUSE LIGHT PASSES THROUGH
THE PAPER

COMMENTS

USE SPACE BELOW FOR FREE FORM COMMENTS. IDENTIFY BY QUESTION
NUMBER WHEN APPROPRIATE. These free form comments will be available
only to the instructor.

SAMPLE

Figure B-15: SOF Form (Back)

110

DEPARTMENT OF SYSTEMS MANAGEMENT

Course Journal

Course No.: _____   Instructor_____

Title: _____

Quarter: _____   Academic Year 19__

_____ Complete Course Journal already on file (See _____ /_____)
                                                      Qtr   AY

Textbook(s): _____

_____

_____

_____

_____

Frequency Distribution of Grades

Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	X	I	P	F
Points	4.0	3.7	3.3	3.0	2.7	2.3	2.0	1.7	1.3	1.0	0.0			
Frequency														

Composite QPR for class based on letter grades awarded _____

Attachments (check all that apply)

_____ Course outline/assignment schedule or description of course
      as actually taught this quarter

_____ Reading list

_____ Homework assignments, projects, term papers, etc.

_____ Examinations and quizzes

_____ Other materials (notes, handouts, case studies, etc.)

_____ Comments about course, tests, students, etc.; recommendations

_____   _____
Signature of Instructor   Co-instructor

Figure B-16: Course Journal

APPENDIX C – USER MANUAL

USER Manual

July 1997
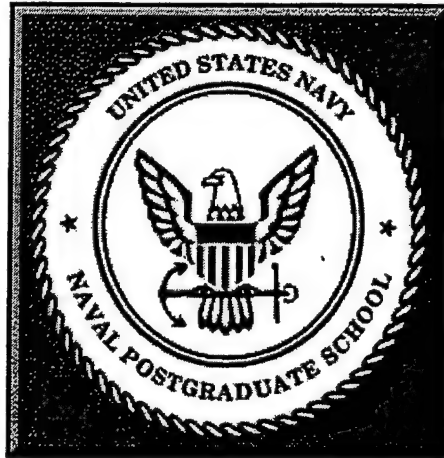
SMIDSS

Systems Management Intranet Decision Support System

(An Intranet based decision support tool Faculty, Staff, Administrators and

Students of the Department of Systems Management

User Manual

This manual will cover the specific requirements for accessing the Systems Management Intranet Decision Support system. (SMIDSS). This manual is not intended to provide instruction on an individual WWW browser.

In order to use SMIDSS users are expected to know how to do the following.

- Start their computer

- Log onto the Department of Systems Management local area network (LAN)

- Start the WWW browser

Required Software:

The only required software for a client machine is an HTML 3 compliant WWW browser. Free versions of a compatible browser are available from Microsoft at http://www.microsoft.com/. Or contact the computer support personnel in the department.

Security:

In order to access any of the SMIDSS processes you must have a valid user name and password. Contact the SMIDSS system administrator for an account.

Upon creating your account you will be placed in a user group. You will be a student, faculty, staff or the department chairman. Each of these types of users has access to different areas of SMIDSS.

All Users:

In order to access the SMIDSS homepage, direct your browser to the following

URL: http://131.120.41.90/SMIDSS/homepage.htm.   The following page will be displayed as

shown in Figure 1.

Welcome to SMIDSS

This page is for the intended use of the Department Prototype Administrator, Education Technician, Faculty and Students of the Department of Systems Management, Naval Postgraduate School, Monterey, CA. Access to links from this pages requires a UserID and Password.

- System Description
- User Processes

System Description

Welcome to the Systems Management Intranet Decision Support System.

The System consists of:
1 Pentium 166MHZ server (OS is Windows NT 4.0 Workstation)
Server Software: O'Reilly's Website Professional
ODBC Database Connectivity: Allaire Corp's Cold Fusion Professional (Version 2.0)
Database: MS Access Version 7.0 format

Processes

Type User	Description
Prototype Administrator	Menu options for the Administrator
Education Technician	Menu options for the Department Ed Tech
Faculty	Menu options of teaching and advising faculty
Student	Menu options for enrolled students
Staff	Menu options for Department Staff

View the User's Manual

Naval Postgraduate School
Department of Systems Management
Monterey, CA 93943

Figure C-1: SMIDSS Homepage

From this page you will be able to access the processes based upon the "Type User" you

are.

Students:

Students have access to the SOF completion form only during a specified period at the end of each academic quarter. The username and password for this area will change frequently. Their respective section leader will give students the username and password. Students can also access the general information data retrieval functions of SMIDSS. Information in this area includes faculty information (Such as phone number, e-mail address, office, etc.) and course information.

Students will not be able to add information or make changes to information in the database.
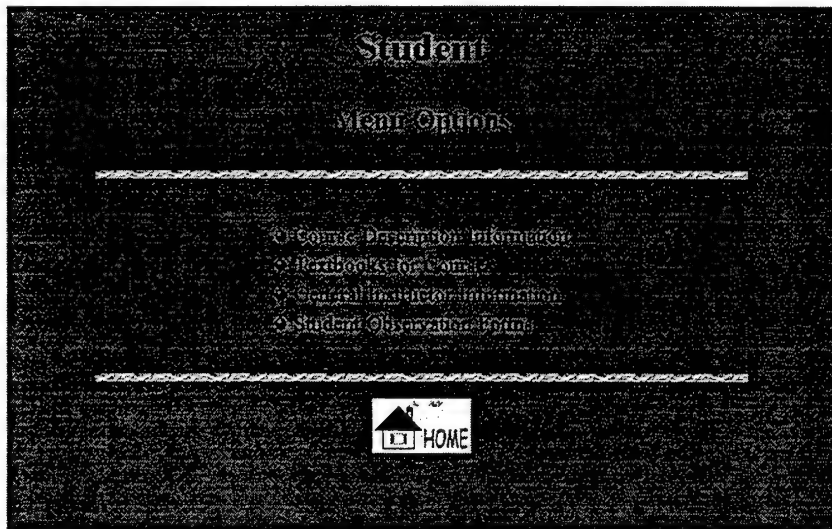
Figure C-2: Student Homepage

Faculty:

Faculty have access to the general information retrieval area. Faculty are not allowed to make changes directly to the database. Any modifications to the database should be sent to education technician. When changes to the database are made, SMIDSS will send verification e-mail to you when the changes are posted.
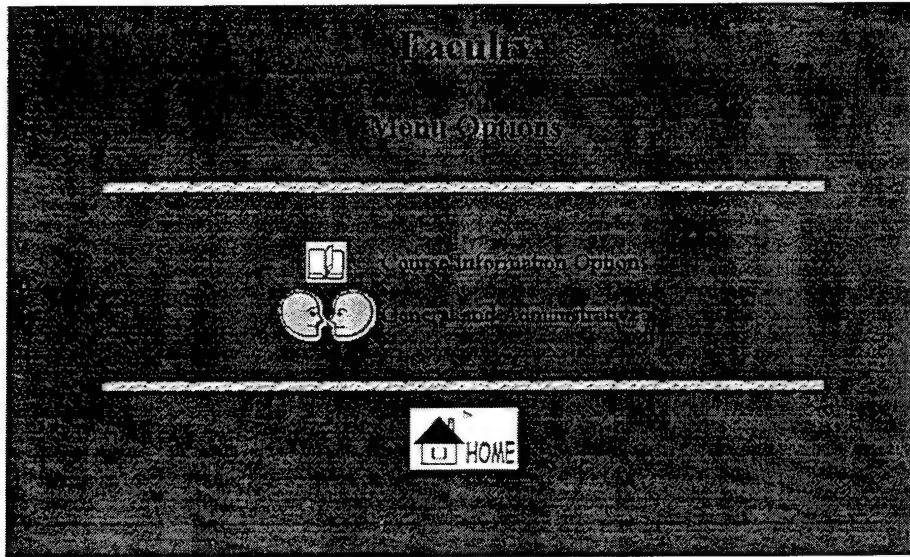
Figure C-3: Faculty Homepage

Faculty members also have access to course information and resources. These resources are used to capture information pertaining to courses and scheduling. All information is stored in a secured database. The information is only available to faculty, and department administration personnel.
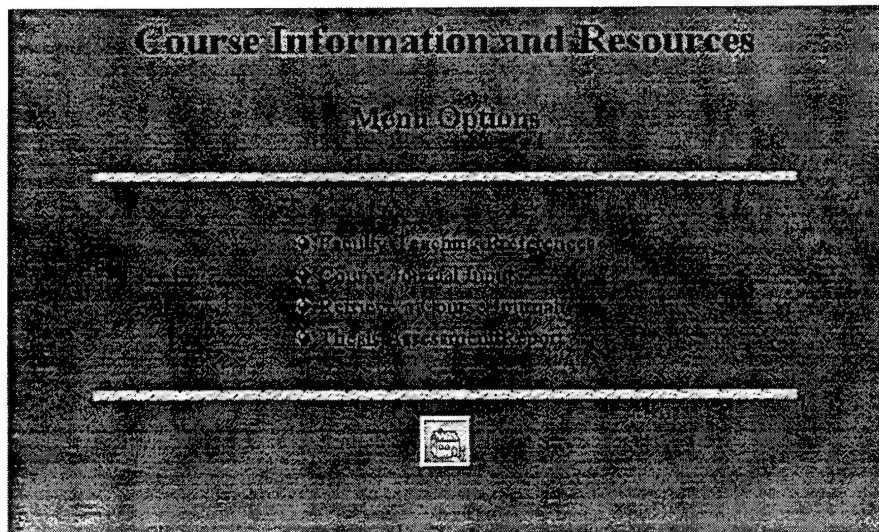
Figure C-4: Faculty Course Information and Resources

Staff:

Department members have access to the general information retrieval area of SMIDSS.

Staff members are not allowed to make changes directly to the database.
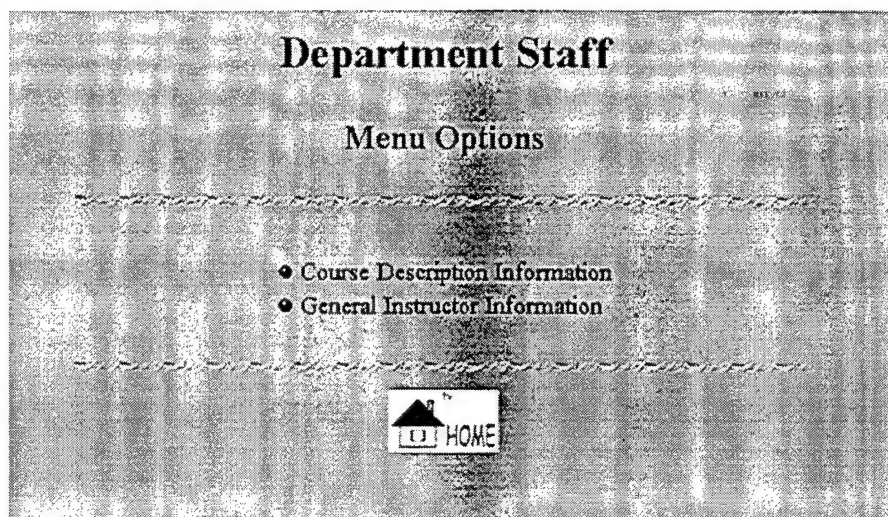
Figure C-5: Staff Homepage

Education Technician pages:
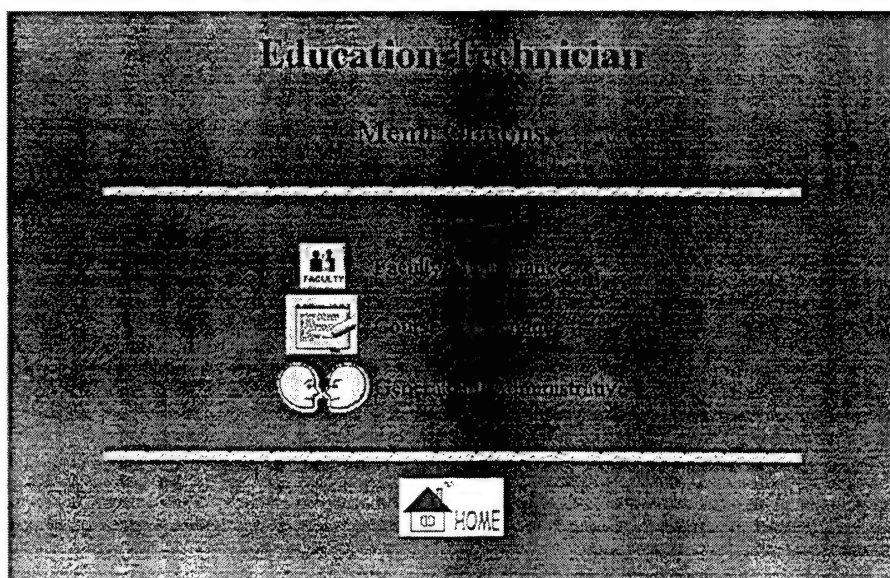
Figure C-6: Education Technician Homepage

Textbook Process:

As the Education Technician, you can order individual textbooks, adding them to your database or you can view and print the department textbook requisition database. This is done by accessing the General and Administrative page.
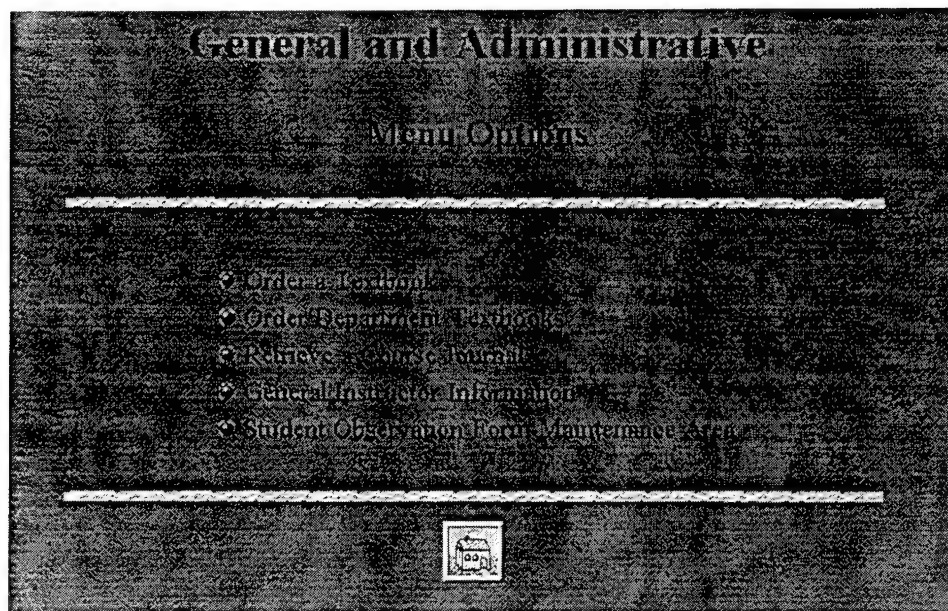
Figure C-7: Education Technician General and Administrative

SOF Maintenance:

The SOF Maintenance Area may be accessed through the General and Administrative page from the Education Technician Homepage.

At a specified point in each quarter you should create blank files to store student SOF Comments.

WARNING: THIS PROCESS OVERWRITES ALL PREVIOUS VERSIONS OF SOF COMMENT FILES AND CANNOT BE REVERSED.

To create the files go to the Student Observation Form Maintenance Area. You have the option of creating files for all instructors for individual instructors.

The SOF Maintenance area is also where you go to create the Department Chairman's SOF report and send SOF Comment e-mails to instructors.

SOF Comment e-mails should only be sent when you are instructed to do so. Each instructor will receive only one e-mail containing comments for all course he/she taught in the last SOF period.

Course Maintenance:
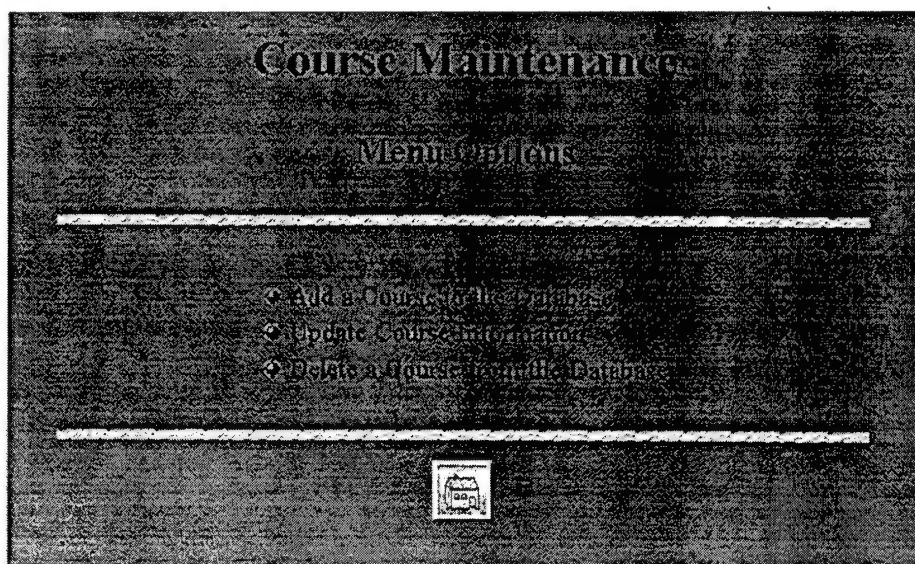
Figure C-8: Education Technician Course Maintenance

Course Maintenance may be accessed through the Course Maintenance page from the Education Technician Homepage.

The following processes are available: Add a Course to the Database, Update Course Information, and Delete a Course from the Database.

WARNING: UPDATING AND DELETING INFORMATION IS NOT REVERSIBLE!

Faculty Maintenance:

Faculty Maintenance may be accessed through the Faculty Maintenance Page from the Education Technician Homepage.
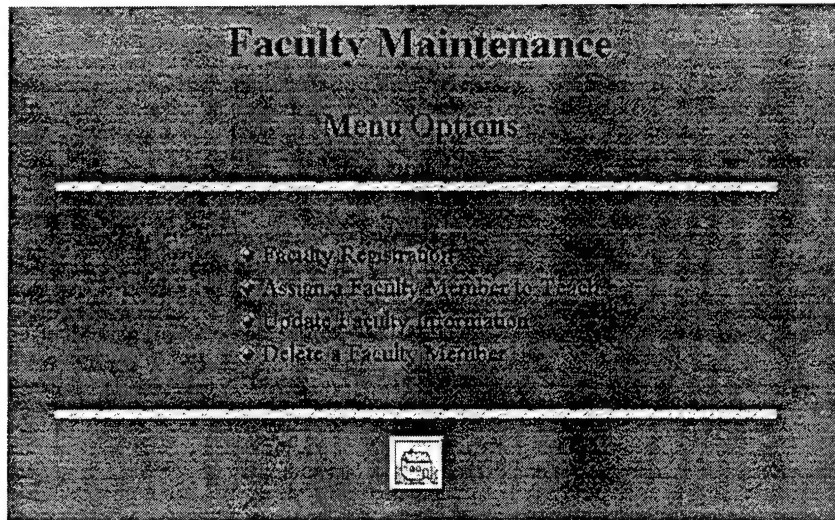
Figure C-9: Education Technician Faculty Maintenance

The following processes are available: Faculty Registration (Add a faculty member to the database), Assign a Faculty Member to Teach, Update Faculty Information, and Delete a Faculty Member.

WARNING: UPDATING AND DELETING INFORMATION IS NOT REVERSIBLE!

SMIDSS Administrator Page:

The administrator link takes you to the Prototype test page. This page has a link to each prototype process and is intended as a efficient means to update pages and test links. From the Website Properties set up the SMIDSS Administrator will have access to previously addressed pages for all classes of users (See the SMIDSS Administrator's Manual for more information).

Security:

Access to any of the SMIDSS Process pages requires a username and password. Usernames and passwords can be obtained from the SMIDSS system administrator. A link to the SMIDSS Administrator is located on the SMIDSS Homepage.

Authentication:

Upon trying to access a process page a window like Figure 10 will pop up
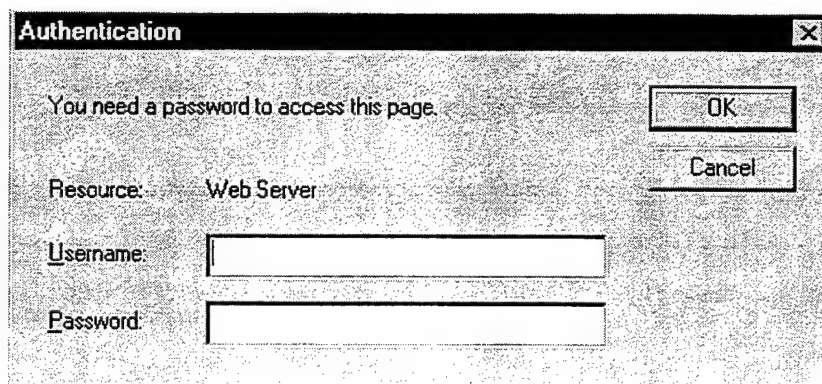
Figure C-10: Authentication Window

To continue enter your SMIDSS username and password and select OK.

Entering information:

Entering information involves typing into a textbox, or making selections from dropdown lists, checkboxes or radio buttons as shown in Figure 11.
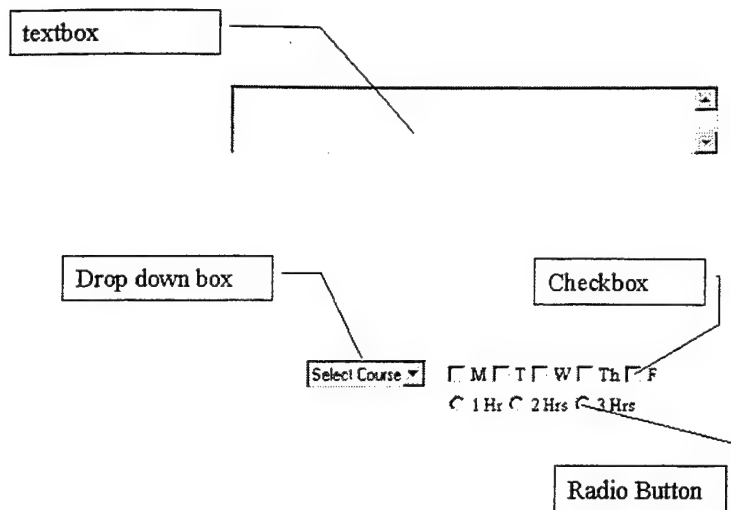
Figure C-11: Input Options

A selection from drop down boxes involves clicking on the down arrow.

Selections for check boxes (squares) and radio buttons (circles) involve clicking inside the shape. Checkboxes allow you to make multiple selections. A radio button allows you to make only one selection from the options displayed.

Pressing the submit button submits your information to the database and causes a verification page to appear. In some instances SMIDSS will also send an e-mail veirifaction message t the users. You may back out of any page by simply using the browsers back button.

APPENDIX D – ADMINISTRATOR MANUAL

System Administrator Manual

July 1997

SMIDSS

Systems Management Intranet Decision Support System

(An Intranet based decision support tool Faculty, Staff, Administrators and

Students of the Department of Systems Management

Administrators Manual

This manual will cover the specific requirements for installation and setup of the software components of the Systems Management Intranet Decision Support system. (SMIDSS).

The specific software components are the webserver, ODBC server, webpages and database files.

Installation:

The actual installation of the webserver and ODBC server are automated and sufficiently covered in the appropriate user manuals accompanying the software.

After installing the Webserver a directory structure as depicted in figure 1 should be created.
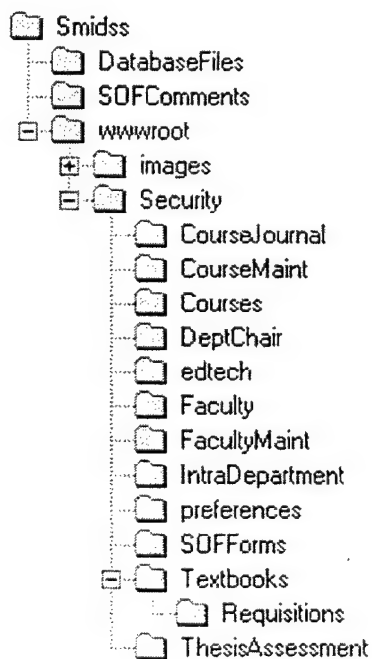
Figure D-1: SMIDSS Directory Structure

The SMIDSS directory is used to provide a single directory off the directory tree of the host machine to store all the SMIDSS Files. Note: The Webserver, if installed according to the defaults, will reside in a different directory.

The DatabaseFiles directory, as the name implies, is used to store the database that supports the decision support function of SMIDSS. The location is such that the files are higher in the directory than the root directory of the webserver (wwwroot). The directory is placed higher in the structure so that the webserver security will prevent any Intranet network user to access the datafiles directly. This is done by the webserver by restricting access of users to directories below the specified root. (Specifying the webserver root will be covered later).

There is actually only one datafile used by SMIDSS. The file nine tables.

The actual structure of the tables is included at appendix 5.

Similarly SOFComments is placed hierarchically higher in the structure. The purpose of the SOFComments directory is to securely store the comments made by students on the SOF input form.

The wwwroot directory holds all the HTML (and DBML) pages that the server displays to users. Additionally by default, your main welcome page, or homepage is stored in the wwwroot directory.

All of the subdirectories of wwwroot contain pages linked to a specific process or function. Establishing subdirectories for each process will facilitate maintenance and modification of page design.

Mnemonics are used for the directory naming so that the process they are related to is clear. The entire SMIDSS directory should be protected from casual browsing by not sharing or allowing access from the LAN. You don't want to allow unauthorized users to place HTML pages into to the SMIDSS system that may allow them to access restricted information. The databasefiles and the SOFComments directories should be protected so that only the SMIDSS system administrator can access these directories. This is necessary to ensure the integrity and confidentiality of the information.

The security directory is used to further subordinate the HTML files from the level of the wwwroot. The name of the directory serves as a visual reminder that the pages provide access to different classes of users based on the permissions granted to the users.

The deptchair and edtech contain pages intended for a specific class of user. User classes will be discussed later. In the website properties, access should be restricted to only the department chairman and education technician for the dept chair directory and the education technician only for the edtech directory.

The faculty directory contains files that collect and display information pertaining to faculty members.

The facultymaint directory holds the pages necessary to make additions, deletions or changes to faculty database information.

The Intradepartment directory contains the files used for communication of messages between the Ed. Tech . and faculty. Although not implemented in the prototype, it is recommended that a subdirectory be created in Intradepartment to handle routine department communications, such as newsletters or other messages for the staff as a group.

The preferences directory holds the files for capturing and displaying faculty teaching preferences.

The textbooks directory has the files necessary to display textbook listings for each course. The subdirectory Requisitions is separate to enable separate security to be placed on the actual requisition forms. For example, students and faculty can access the information about what texts are required for a class, but only faculty can requisition a text.

The ThesisAssessment directory holds the pages that collect information pertaining to thesis assessments.

SECURITY

The SMIDSS system administrator is the only person that should be allowed to place files in any of the SMIDSS directories. Also, the webserver properties should be secured to that the administrator is the only user that can access the webserver controls.

In order to facilitate access while maintaining security the following user classes should be established in the webserver properties.

- System administrator

- Dept Admin

- Student

- Faculty

- Staff

WEBSITE

Webserver properties can be set from either the Start **Start** Menu, or by right clicking the website icon in the tray on the active title bar.
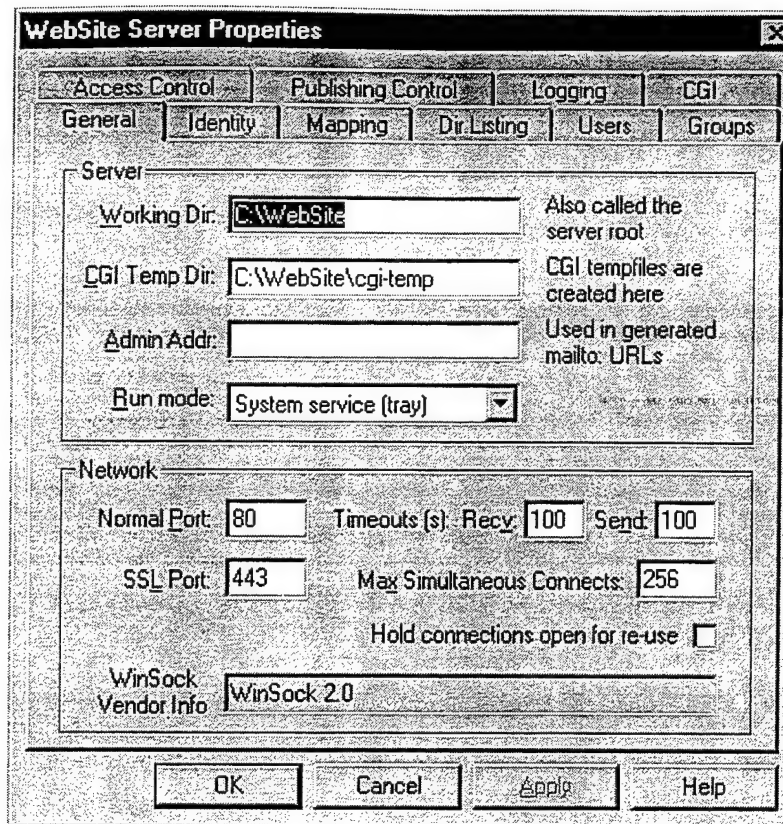
Figure D-2: Website Server Properties

The Working Dir: is the location of the website files. This should not be changed.

CGI Temp Dir is used by website for the execution of CGI scripts. This should not be changed.

Admin Addr: is not required. This is used if the administrator wants to automatically add a webmaster address to pages.

Run mode selects how the server runs. The options are System service (Tray), System Service (hidden), Application (minimized) and Application (Tray). Only the last two are options when used in Windows 95 since Windows 95 does not support services. It is recommended that the server run as a System service (Tray) when running in Windows NT.

The network section allows you to change any network connection parameters. The defaults are shown and should be used unless the network configuration requires a change.
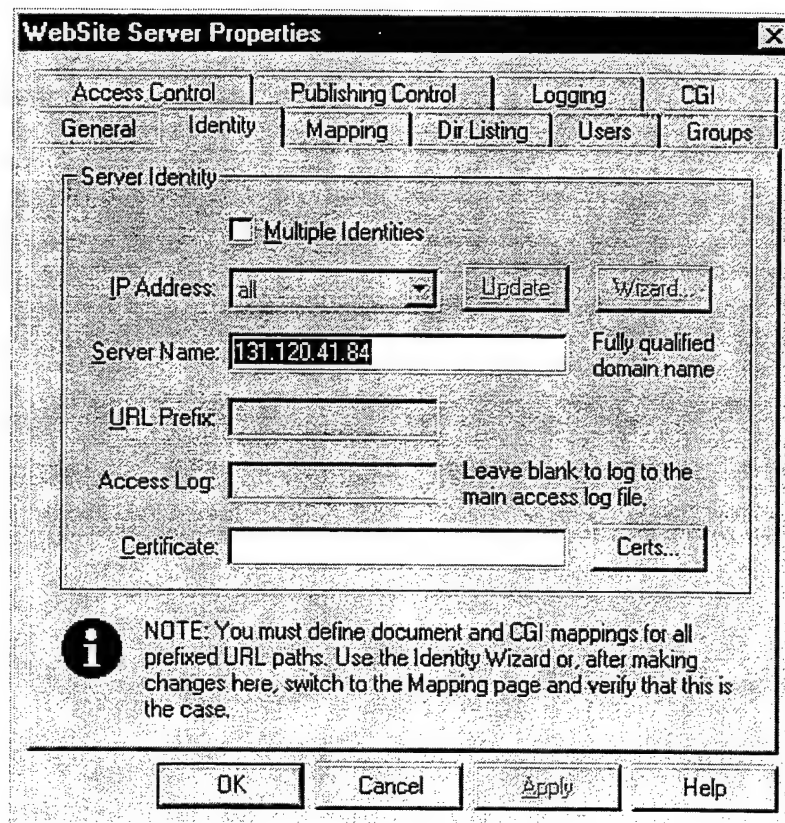
Figure D-3: Website Identity

The identity tab is used to specify or change the URL or IP address of the server. This tab does not change the IP address contained in the network properties tab of the OS. The server name is initially entered when website is installed. This tab is also where multiple identities are established as described in the website users manual.

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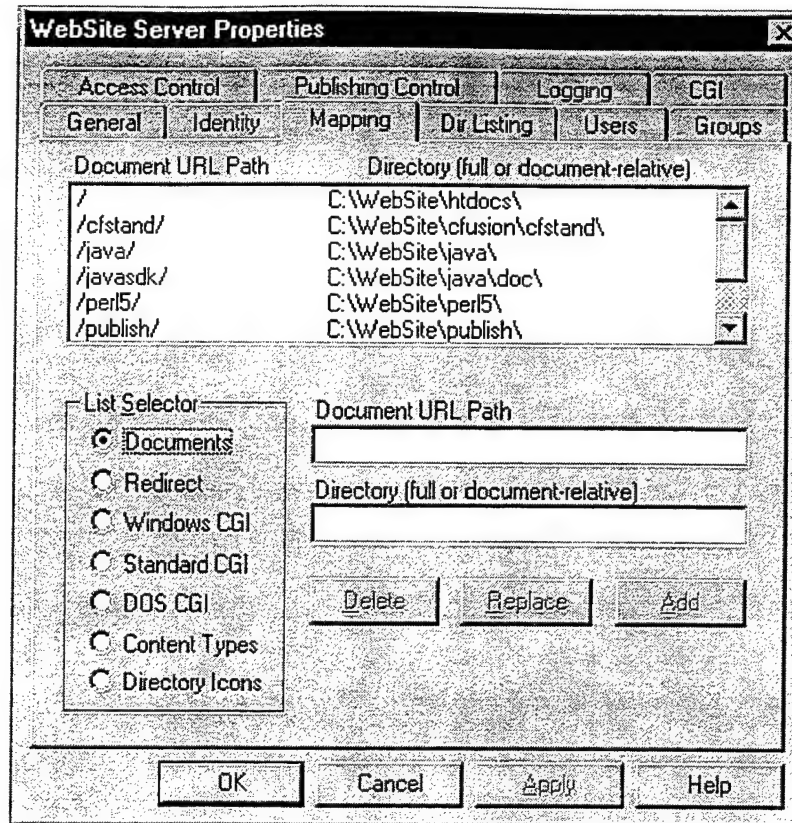
Figure D-4: Website Properties - Mapping

The mapping tab is where you establish the root directory of the server. Website security will not allow access to directories higher that than the root (denoted by /). The only directory you should change is the root.
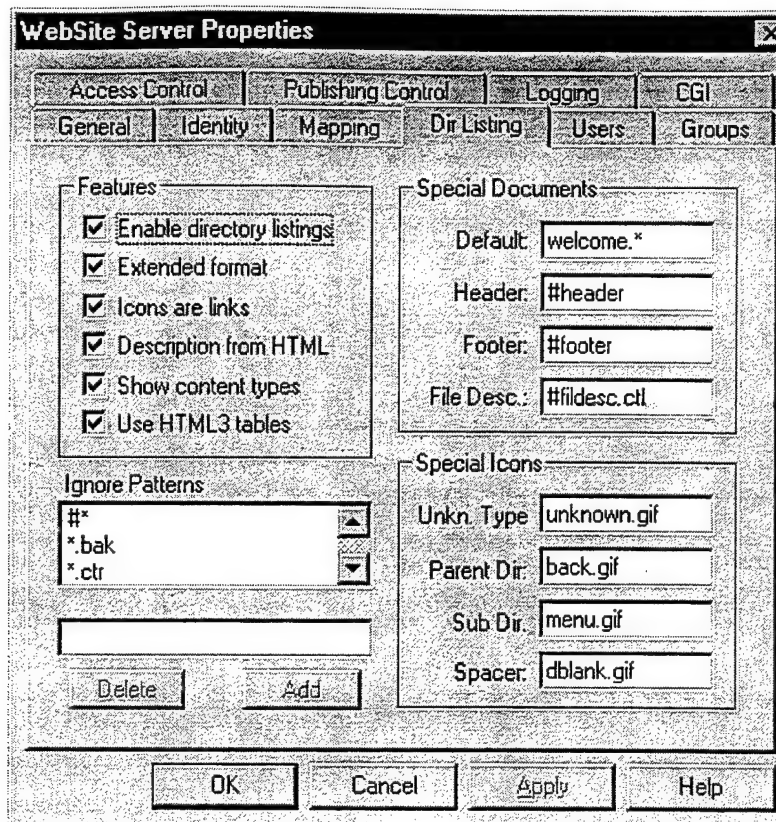
Figure D-5: Website Properties - Dir Listing

The Dir Listing tab contains controls for specifying the default html page, some of the html default tags, and some security features of website. To specify what page is displayed by default, specify a page name in the Special Documents section under the Default Field. In this example if no page is specified in a URL, the webserver will display a page that begins with welcome.* (wildcards are in effect). As shown in the features section, "Enable directory listings" is enabled. If a file named welcome is not found than the webserver will display a complete directory listing. It is recommended that "Enable directory listings" be disabled to enhance security.
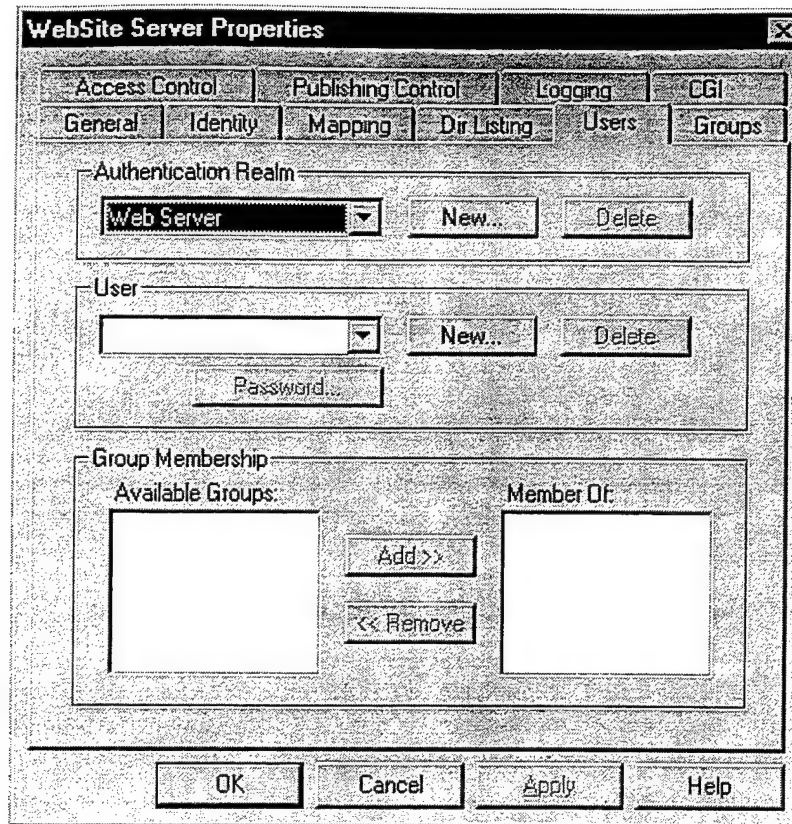
Figure D-6: Website Properties – Users

The users tab is used to set users and passwords. The users created here are not added to the list of workstation or domain users in the OS. Users are also assigned group membership from this tab.
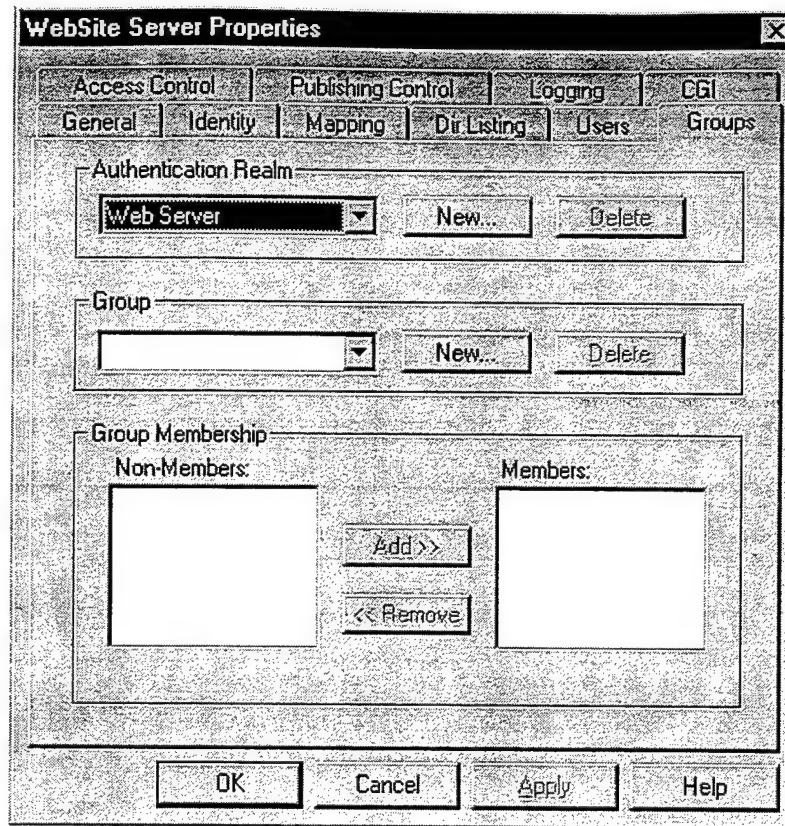
Figure D-7: Website Properties – Groups

The groups tabs is where you create groups or classes of users as recommended above.

You can also assign existing users to groups from this tab.
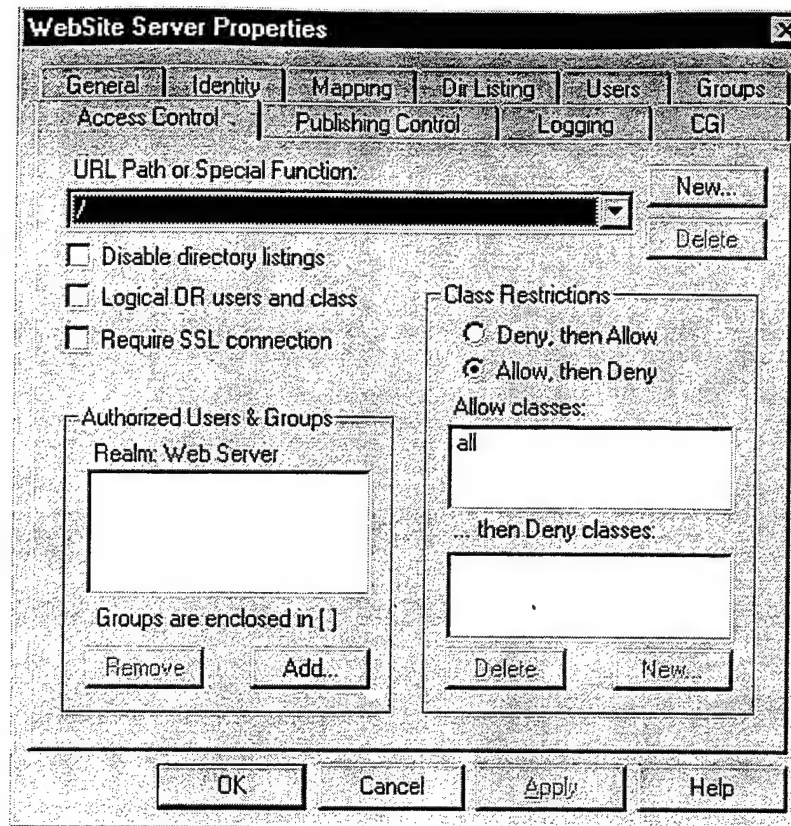
Figure D-8: Website Properties - Access Control

The access control tab is where you specify what groups and users have access to what directories. You can also disable directory listings on a directory by directory basis from this tab.
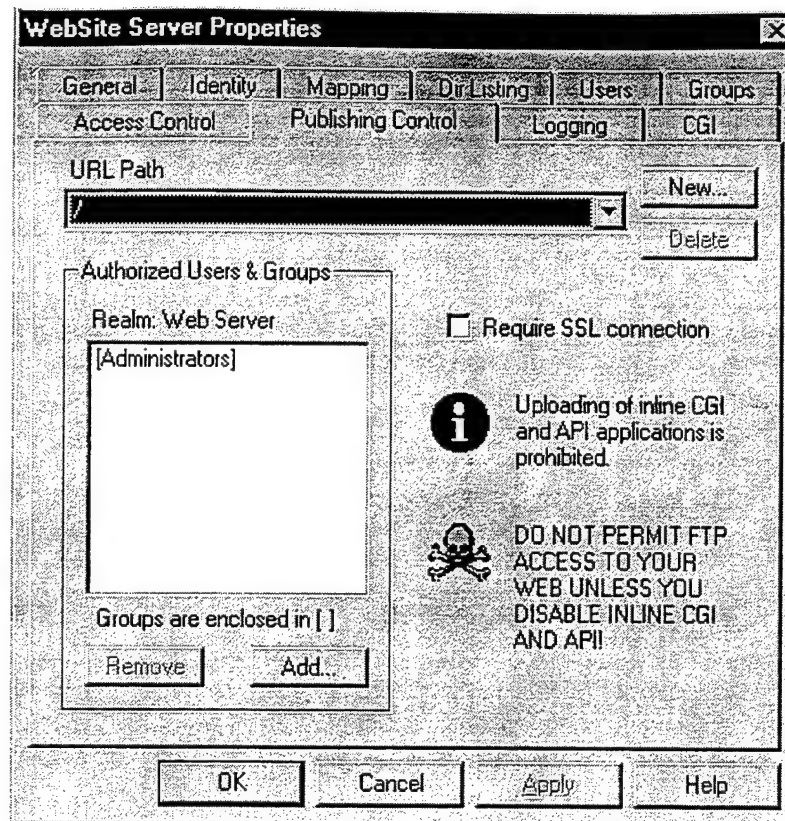
Figure D-9: Website Properties - Publishing control

Publishing control is used to control which users can publish to the site via their web browser (for example Netscape Gold). It is recommended that the values in this tab not be changed.
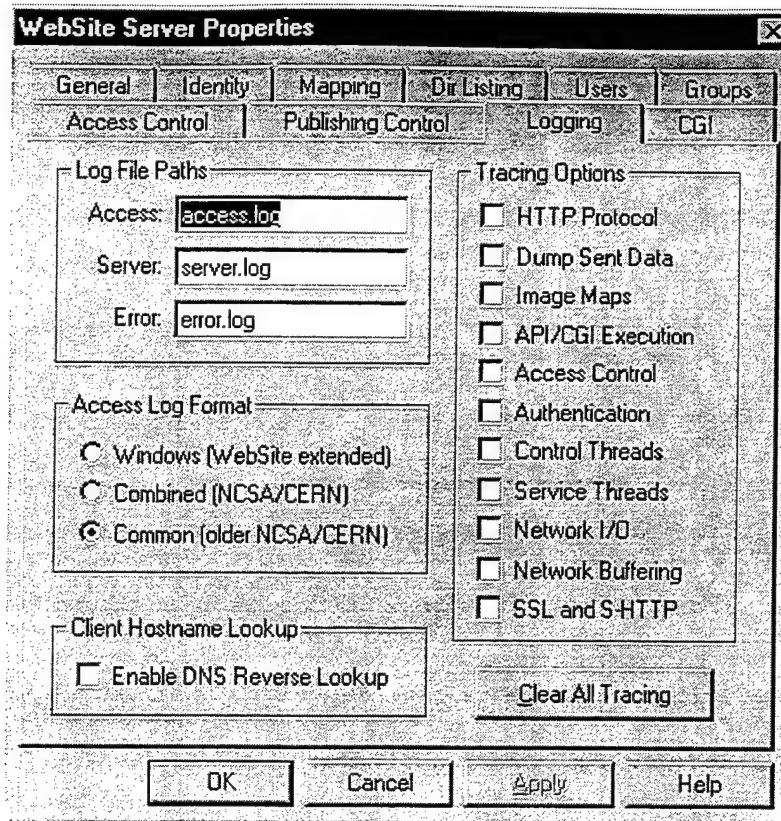
Figure D-10: Website Properties – Logging

Logging is used to specify the names of the log files and what attributes are logged. The

defaults, shown, should be used unless trying to track a specific problem.
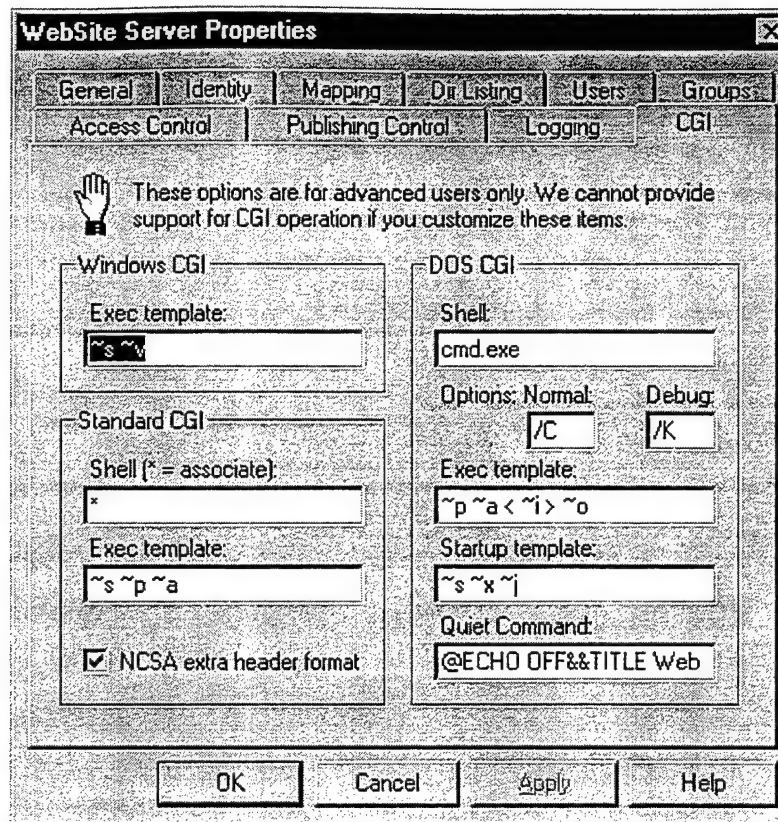
Figure D-11: Website Properties – CGI

The CGI tab is used to modify the CGI functions of Website. CGI was not used in the

SMIDSS prototype. The default values should be maintained.

COLD FUSION

The only options available for the administration of Cold Fusion are the specification of

data files. Cold fusion calls these the datasources.

Datasources are set in either the Cold Fusion administrator, accessed through the Start

menu or through the ODBC icon in the control panel. The interface is the

same.
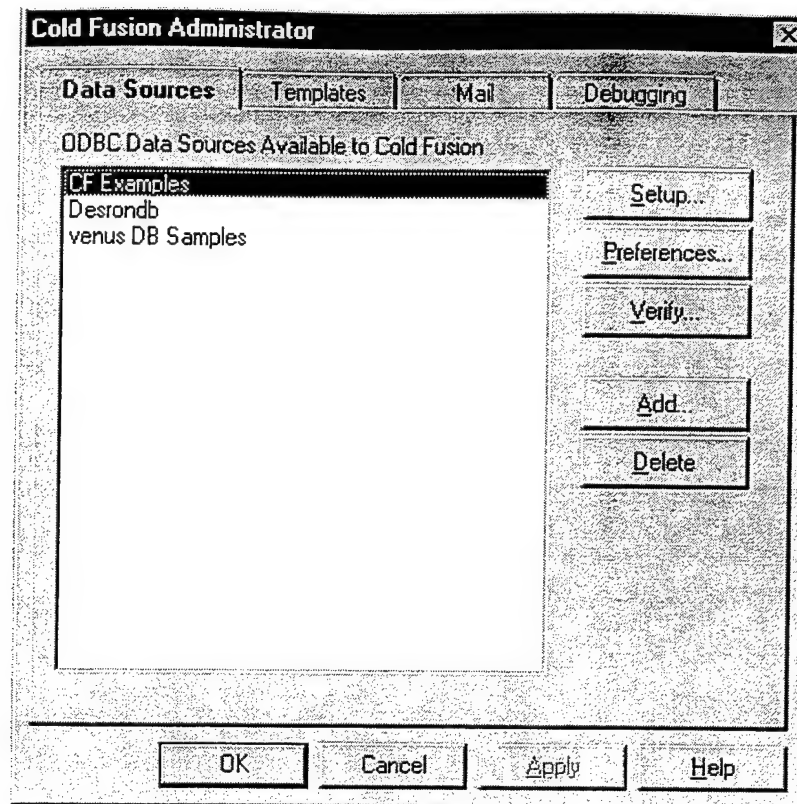
Figure D-12: Cold Fusion Administration

To create a datasource click the Add button.

Then on the resulting window select the appropriate database type that was used to design

the tables. (SMIDSS was designed with Microsoft Access).
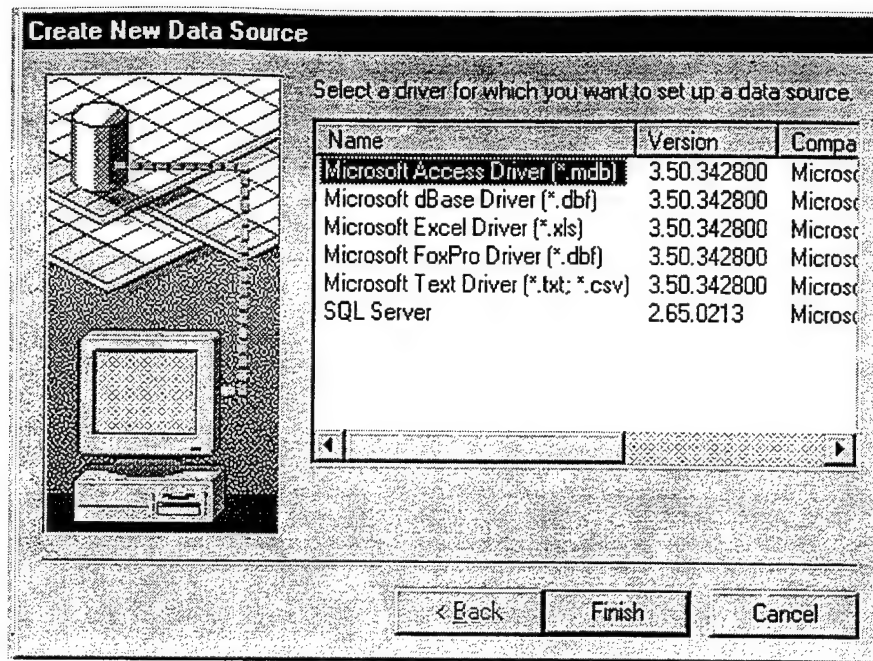
Figure D-13: ODBC Interface

Then select "finish" this displays a window to allow you to browse to the databasefiles directory and select the sched.mdb file.
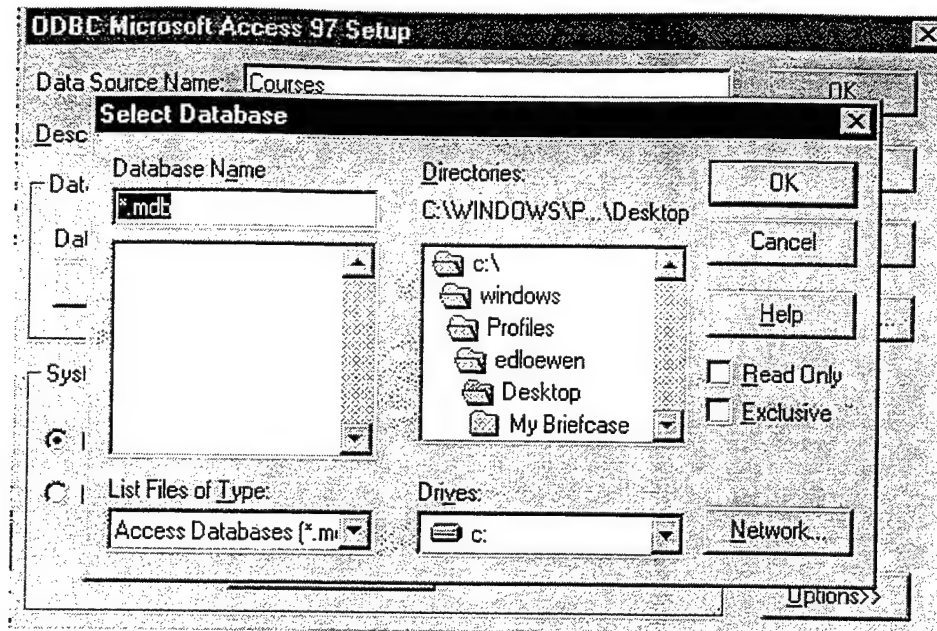
Figure D-14: ODBC Select Database

Selecting the network button allows you to browse to any shared directory on the network to link to a file. Using this option causes a network drive to be mapped to your workstation.

LOGS

As discussed Website logs all access. The logs are stored in ASCII format and can be found in the website\logs directory. The logs should be reviewed periodically. When reviewing the logs you will notice some non-standard ASCII characters. These strings are caused by unknown server errors. The nonstandard ASCII can be safely deleted from the files.

APPENDIX E – DATA DICTIONARY

Table: CourseDescription

<u>Columns</u>

Name	Type	Size
ID	Number (Long)	4

AllowZeroLength:	False
Attributes:	Fixed Size, Auto-Increment
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	1
ColumnWidth:	Default
Ordinal Position:	1
Required:	False
Source Field:	ID
Source Table:	CourseDescription

Name	Type	Size
LabHours	Number (Long)	4

AllowZeroLength:	False
Attributes:	Fixed Size
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
Decimal Places:	Auto
Default Value:	0
DisplayControl:	Text Box
Ordinal Position:	2
Required:	False
Source Field:	LabHours
Source Table:	CourseDescription

Name	Type	Size
LectureHours	Number (Long)	4

AllowZeroLength:	False
Attributes:	Fixed Size
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
Decimal Places:	Auto
Default Value:	0
DisplayControl:	Text Box
Ordinal Position:	3
Required:	False
Source Field:	LectureHours
Source Table:	CourseDescription

Table: CourseDescription

Name	Type	Size
CourseNumber	Text	6

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	1560
DisplayControl:	Text Box
Ordinal Position:	4
Required:	False
Source Field:	CourseNumber
Source Table:	CourseDescription

Name	Type	Size
TitleCourse	Text	50

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default

ColumnWidth:	Default		
DisplayControl:	Text Box		
Ordinal Position:	5		
Required:	False		
Source Field:	TitleCourse		
Source Table:	CourseDescription		

CurricNumber		Text	10
AllowZeroLength:	False		
Attributes:	Variable Length		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	1575		
DisplayControl:	Text Box		
Ordinal Position:	6		
Required:	False		
Source Field:	CurricNumber		
Source Table:	CourseDescription		

Description		Memo	-
AllowZeroLength:	False		
Attributes:	Variable Length		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	7860		
Ordinal Position:	7		
Required:	False		
Source Field:	Description		
Source Table:	CourseDescription		

Quarter		Text	10
AllowZeroLength:	False		
Attributes:	Variable Length		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
DisplayControl:	Text Box		
Ordinal Position:	8		
Required:	False		
Source Field:	Quarter		
Source Table:	CourseDescription		

Segments		Text	3
AllowZeroLength:	False		
Attributes:	Variable Length		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
DisplayControl:	Text Box		
Ordinal Position:	9		
Required:	False		
Source Field:	Segments		
Source Table:	CourseDescription		

YearOffered		Number (Long)	4
AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
Decimal Places:	Auto		
Default Value:	0		
DisplayControl:	Text Box		
Ordinal Position:	10		

Required:	False	
Source Field:	YearOffered	
Source Table:	CourseDescription	

Enrollment		Number (Integer)	2
AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
Decimal Places:	Auto		
Default Value:	0		
DisplayControl:	Text Box		
Ordinal Position:	11		
Required:	False		
Source Field:	Enrollment		
Source Table:	CourseDescription		

Table Indexes

Name		Number of Fields
_ID		1
	Clustered:	False
	Distinct Count:	9
	Foreign:	False
	Ignore Nulls:	False
	Name:	_ID
	Primary:	False
	Required:	False
	Unique:	False
	Fields:	ID, Ascending
Curric_Number		1
	Clustered:	False
	Distinct Count:	2
	Foreign:	False
	Ignore Nulls:	False
	Name:	Curric_Number
	Primary:	False
	Required:	False
	Unique:	False
	Fields:	CurricNumber, Ascending
PrimaryKey		1
	Clustered:	False
	Distinct Count:	9
	Foreign:	False
	Ignore Nulls:	False
	Name:	PrimaryKey
	Primary:	True
	Required:	True
	Unique:	True
	Fields:	ID, Ascending

Table: CourseJournal

Columns

Name	Type	Size
ID	Number (Long)	4

AllowZeroLength:	False
Attributes:	Fixed Size, Auto-Increment
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
Ordinal Position:	1
Required:	False
Source Field:	ID
Source Table:	CourseJournal

Name	Type	Size
CourseNumber	Text	7

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	2
Required:	False
Source Field:	CourseNumber
Source Table:	CourseJournal

Name	Type	Size
Quarter	Text	10

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	3
Required:	False
Source Field:	Quarter
Source Table:	CourseJournal

Name	Type	Size
YearOffered	Number (Long)	4

AllowZeroLength:	False
Attributes:	Fixed Size
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
Decimal Places:	Auto
Default Value:	0
DisplayControl:	Text Box
Ordinal Position:	4
Required:	False
Source Field:	YearOffered
Source Table:	CourseJournal

Name	Type	Size
Description	Memo	-

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
Ordinal Position:	5
Required:	False
Source Field:	Description

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	Source Table:	CourseJournal		
Code_FK			Text	5
	AllowZeroLength:	False		
	Attributes:	Variable Length		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	DisplayControl:	Text Box		
	Ordinal Position:	6		
	Required:	False		
	Source Field:	Code_FK		
	Source Table:	CourseJournal		
NumA			Number (Long)	4
	AllowZeroLength:	False		
	Attributes:	Fixed Size		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	720		
	Decimal Places:	Auto		
	Default Value:	0		
	DisplayControl:	Text Box		
	Ordinal Position:	8		
	Required:	False		
	Source Field:	NumA		
	Source Table:	CourseJournal		
NumAMinus			Number (Long)	4
	AllowZeroLength:	False		
	Attributes:	Fixed Size		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	Decimal Places:	Auto		
	Default Value:	0		
	DisplayControl:	Text Box		
	Ordinal Position:	9		
	Required:	False		
	Source Field:	NumAMinus		
	Source Table:	CourseJournal		
NumBPlus			Number (Long)	4
	AllowZeroLength:	False		
	Attributes:	Fixed Size		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	Decimal Places:	Auto		
	Default Value:	0		
	DisplayControl:	Text Box		
	Ordinal Position:	10		
	Required:	False		
	Source Field:	NumBPlus		
	Source Table:	CourseJournal		
NumB			Number (Long)	4
	AllowZeroLength:	False		
	Attributes:	Fixed Size		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	Decimal Places:	Auto		
	Default Value:	0		

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DisplayControl:	Text Box	
Ordinal Position:	11	
Required:	False	
Source Field:	NumB	
Source Table:	CourseJournal	

NumBMinus		Number (Long)	4
AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
Decimal Places:	Auto		
Default Value:	0		
DisplayControl:	Text Box		
Ordinal Position:	12		
Required:	False		
Source Field:	NumBMinus		
Source Table:	CourseJournal		

NumCPlus		Number (Long)	4
AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
Decimal Places:	Auto		
Default Value:	0		
DisplayControl:	Text Box		
Ordinal Position:	13		
Required:	False		
Source Field:	NumCPlus		
Source Table:	CourseJournal		

NumC		Number (Long)	4
AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
Decimal Places:	Auto		
Default Value:	0		
DisplayControl:	Text Box		
Ordinal Position:	14		
Required:	False		
Source Field:	NumC		
Source Table:	CourseJournal		

NumCMinus		Number (Long)	4
AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
Decimal Places:	Auto		
Default Value:	0		
DisplayControl:	Text Box		
Ordinal Position:	15		
Required:	False		
Source Field:	NumCMinus		
Source Table:	CourseJournal		

NumDPlus		Number (Long)	4
AllowZeroLength:	False		
Attributes:	Fixed Size		

Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
Decimal Places:	Auto		
Default Value:	0		
DisplayControl:	Text Box		
Ordinal Position:	16		
Required:	False		
Source Field:	NumDPlus		
Source Table:	CourseJournal		

NumD Number (Long) 4

AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
Decimal Places:	Auto		
Default Value:	0		
DisplayControl:	Text Box		
Ordinal Position:	17		
Required:	False		
Source Field:	NumD		
Source Table:	CourseJournal		

NumDMinus Number (Long) 4

AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
Decimal Places:	Auto		
Default Value:	0		
DisplayControl:	Text Box		
Ordinal Position:	18		
Required:	False		
Source Field:	NumDMinus		
Source Table:	CourseJournal		

NumX Number (Long) 4

AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
Decimal Places:	Auto		
Default Value:	0		
DisplayControl:	Text Box		
Ordinal Position:	19		
Required:	False		
Source Field:	NumX		
Source Table:	CourseJournal		

NumIncomplete Number (Long) 4

AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
Decimal Places:	Auto		
Default Value:	0		
DisplayControl:	Text Box		
Ordinal Position:	20		
Required:	False		
Source Field:	NumIncomplete		

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	Source Table:	CourseJournal		
NumPass			**Number (Long)**	**4**
	AllowZeroLength:	False		
	Attributes:	Fixed Size		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	Decimal Places:	Auto		
	Default Value:	0		
	DisplayControl:	Text Box		
	Ordinal Position:	21		
	Required:	False		
	Source Field:	NumPass		
	Source Table:	CourseJournal		
NumFail			**Number (Long)**	**4**
	AllowZeroLength:	False		
	Attributes:	Fixed Size		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	Decimal Places:	Auto		
	Default Value:	0		
	DisplayControl:	Text Box		
	Ordinal Position:	22		
	Required:	False		
	Source Field:	NumFail		
	Source Table:	CourseJournal		
CompositeQPR			**Number (Long)**	**4**
	AllowZeroLength:	False		
	Attributes:	Fixed Size		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	Decimal Places:	Auto		
	Default Value:	0		
	DisplayControl:	Text Box		
	Ordinal Position:	23		
	Required:	False		
	Source Field:	CompositeQPR		
	Source Table:	CourseJournal		
Comments			**Memo**	**-**
	AllowZeroLength:	False		
	Attributes:	Variable Length		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	Ordinal Position:	24		
	Required:	False		
	Source Field:	Comments		
	Source Table:	CourseJournal		
Outlinefiled			**Yes/No**	**1**
	AllowZeroLength:	False		
	Attributes:	Fixed Size		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	DisplayControl:	106		
	Format:	Yes/No		
	Ordinal Position:	25		

Required:	False		
Source Field:	Outlinefiled		
Source Table:	CourseJournal		

ReadingListFiled		Yes/No	1
AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
DisplayControl:	106		
Format:	Yes/No		
Ordinal Position:	26		
Required:	False		
Source Field:	ReadingListFiled		
Source Table:	CourseJournal		

Homeworkfiled		Yes/No	1
AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
DisplayControl:	106		
Format:	Yes/No		
Ordinal Position:	27		
Required:	False		
Source Field:	Homeworkfiled		
Source Table:	CourseJournal		

Examsfiled		Yes/No	1
AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
DisplayControl:	106		
Format:	Yes/No		
Ordinal Position:	28		
Required:	False		
Source Field:	Examsfiled		
Source Table:	CourseJournal		

Otherfiled		Yes/No	1
AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
DisplayControl:	106		
Format:	Yes/No		
Ordinal Position:	29		
Required:	False		
Source Field:	Otherfiled		
Source Table:	CourseJournal		

Table Indexes

Name	Number of Fields
_ID	1
Clustered:	False
Distinct Count:	12
Foreign:	False
Ignore Nulls:	False

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Name:	_ID
Primary:	False
Required:	False
Unique:	False
Fields:	ID, Ascending
PrimaryKey	1
Clustered:	False
Distinct Count:	12
Foreign:	False
Ignore Nulls:	False

Table: CourseJournal

Name:	PrimaryKey
Primary:	True
Required:	True
Unique:	True
Fields:	ID, Ascending

Table: Curric
Columns

Name	Type	Size
CurricName	Text	60

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	1
ColumnWidth:	5850
DisplayControl:	Text Box
Ordinal Position:	1
Required:	False
Source Field:	CurricName
Source Table:	Curric

Name	Type	Size
CurricNumber	Text	10

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	2
Required:	False
Source Field:	CurricNumber
Source Table:	Curric

Name	Type	Size
AcadAssoc	Text	5

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	3
Required:	False
Source Field:	AcadAssoc
Source Table:	Curric

Table Indexes

Name	Number of Fields

155

Table: Curric

PrimaryKey   1

Clustered:	False
Distinct Count:	15
Foreign:	False
Ignore Nulls:	False
Name:	PrimaryKey
Primary:	True
Required:	True
Unique:	True
Fields:	CurricNumber, Ascending

Table: FacPref

<u>Columns</u>

Name	Type	Size
LastName	Text	20

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	1
Required:	False
Source Field:	LastName
Source Table:	FacPref

Name	Type	Size
CourseNumber	Text	6

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	2
Required:	False
Source Field:	CourseNumber
Source Table:	FacPref

Name	Type	Size
Quarter	Text	10

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	3
Required:	False
Source Field:	Quarter
Source Table:	FacPref

Table: FACULTY
<u>Columns</u>

Name	Type	Size
emailaddress	Text	35

AllowZeroLength:	False
Attributes:	Variable Length

Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	3765		
DisplayControl:	Text Box		
Ordinal Position:	1		
Required:	False		
Source Field:	emailaddress		
Source Table:	FACULTY		

FirstName   Text   20

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	2
Required:	False
Source Field:	FirstName
Source Table:	FACULTY

LastName   Text   20

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	3
Required:	False
Source Field:	LastName
Source Table:	FACULTY

Telephone   Text   15

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	4
Required:	False
Source Field:	Telephone
Source Table:	FACULTY

OfficeNumber   Text   10

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	5
Required:	False
Source Field:	OfficeNumber
Source Table:	FACULTY

ID   Number (Long)   4

AllowZeroLength:	False
Attributes:	Fixed Size, Auto-Increment
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default

Ordinal Position:	6		
Required:	False		
Source Field:	ID		
Source Table:	FACULTY		

Name		Type	Size
CODE		Text	5

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	7
Required:	False
Source Field:	CODE
Source Table:	FACULTY

Table Indexes

Name		Number of Fields
_ID		1
	Clustered:	False
	Distinct Count:	82
	Foreign:	False
	Ignore Nulls:	False
	Name:	_ID
	Primary:	False
	Required:	False
	Unique:	False
	Fields:	ID, Ascending
CODE		1
	Clustered:	False
	Distinct Count:	81
	Foreign:	False
	Ignore Nulls:	False
	Name:	CODE
	Primary:	False
	Required:	False
	Unique:	False
	Fields:	CODE, Ascending
PrimaryKey		1
	Clustered:	False
	Distinct Count:	82
	Foreign:	False
	Ignore Nulls:	False
	Name:	PrimaryKey
	Primary:	True
	Required:	True
	Unique:	True
	Fields:	ID, Ascending

Table: SOFInput
Columns

Name		Type	Size
Code		Text	5

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	1
Required:	False
Source Field:	Code

	Source Table:	SOFInput		
_ID			Number (Long)	4
	AllowZeroLength:	False		
	Attributes:	Fixed Size, Auto-Increment		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	Ordinal Position:	2		
	Required:	False		
	Source Field:	_ID		
	Source Table:	SOFInput		
CourseNumber			Text	6
	AllowZeroLength:	False		
	Attributes:	Variable Length		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	DisplayControl:	Text Box		
	Ordinal Position:	3		
	Required:	False		
	Source Field:	CourseNumber		
	Source Table:	SOFInput		
SegmentNumber			Text	10
	AllowZeroLength:	False		
	Attributes:	Variable Length		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	1755		
	DisplayControl:	Text Box		
	Ordinal Position:	4		
	Required:	False		
	Source Field:	SegmentNumber		
	Source Table:	SOFInput		
SubSOFNumber			Number (Long)	4
	AllowZeroLength:	False		
	Attributes:	Fixed Size		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	Decimal Places:	Auto		
	DisplayControl:	Text Box		
	Ordinal Position:	6		
	Required:	False		
	Source Field:	SubSOFNumber		
	Source Table:	SOFInput		
SOFNumber			Text	10
	AllowZeroLength:	False		
	Attributes:	Variable Length		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	DisplayControl:	Text Box		
	Ordinal Position:	7		
	Required:	False		
	Source Field:	SOFNumber		
	Source Table:	SOFInput		
CurricNum			Number (Long)	4
	AllowZeroLength:	False		

Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
Decimal Places:	Auto		
DisplayControl:	Text Box		
Ordinal Position:	8		
Required:	False		
Source Field:	CurricNum		
Source Table:	SOFInput		

HrsThisQtr   Number (Integer)   2

AllowZeroLength:	False
Attributes:	Fixed Size
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
Decimal Places:	Auto
DisplayControl:	Text Box
Ordinal Position:	9
Required:	False
Source Field:	HrsThisQtr
Source Table:	SOFInput

QtrsComplete   Number (Integer)   2

AllowZeroLength:	False
Attributes:	Fixed Size
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
Decimal Places:	Auto
DisplayControl:	Text Box
Ordinal Position:	10
Required:	False
Source Field:	QtrsComplete
Source Table:	SOFInput

SOFQuestion_1   Number (Integer)   2

AllowZeroLength:	False
Attributes:	Fixed Size
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	1875
Decimal Places:	Auto
Default Value:	0
DisplayControl:	Text Box
Ordinal Position:	11
Required:	False
Source Field:	SOFQuestion_1
Source Table:	SOFInput

SOFQuestion_2   Number (Integer)   2

AllowZeroLength:	False
Attributes:	Fixed Size
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	1875
Decimal Places:	Auto
DisplayControl:	Text Box
Ordinal Position:	12
Required:	False
Source Field:	SOFQuestion_2
Source Table:	SOFInput

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SOFQuestion_3		Number (Integer)	2
AllowZeroLength:		False	
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	1935		
Decimal Places:	Auto		
DisplayControl:	Text Box		
Ordinal Position:	13		
Required:	False		
Source Field:	SOFQuestion_3		
Source Table:	SOFInput		

SOFQuestion_4		Number (Integer)	2
AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	1755		
Decimal Places:	Auto		
DisplayControl:	Text Box		
Ordinal Position:	14		
Required:	False		
Source Field:	SOFQuestion_4		
Source Table:	SOFInput		

SOFQuestion_5		Number (Integer)	2
AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	1695		
Decimal Places:	Auto		
DisplayControl:	Text Box		
Ordinal Position:	15		
Required:	False		
Source Field:	SOFQuestion_5		
Source Table:	SOFInput		

SOFQuestion_6		Number (Integer)	2
AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	1815		
Decimal Places:	Auto		
DisplayControl:	Text Box		
Ordinal Position:	16		
Required:	False		
Source Field:	SOFQuestion_6		
Source Table:	SOFInput		

SOFQuestion_7		Number (Integer)	2
AllowZeroLength:	False		
Attributes:	Fixed Size		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	1740		
Decimal Places:	Auto		
DisplayControl:	Text Box		
Ordinal Position:	17		
Required:	False		
Source Field:	SOFQuestion_7		
Source Table:	SOFInput		

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SOFQuestion_8   Number (Integer)   2
    AllowZeroLength: False
    Attributes: Fixed Size
    Collating Order: General
    ColumnHidden: False
    ColumnOrder: Default
    ColumnWidth: 1635
    Decimal Places: Auto
    DisplayControl: Text Box
    Ordinal Position: 18
    Required: False
    Source Field: SOFQuestion_8
    Source Table: SOFInput

SOFQuestion_9   Number (Integer)   2
    AllowZeroLength: False
    Attributes: Fixed Size
    Collating Order: General
    ColumnHidden: False
    ColumnOrder: Default
    ColumnWidth: 1620
    Decimal Places: Auto
    DisplayControl: Text Box
    Ordinal Position: 19
    Required: False
    Source Field: SOFQuestion_9
    Source Table: SOFInput

SOFQuestion_10   Number (Integer)   2
    AllowZeroLength: False
    Attributes: Fixed Size
    Collating Order: General
    ColumnHidden: False
    ColumnOrder: Default
    ColumnWidth: 1815
    Decimal Places: Auto
    DisplayControl: Text Box
    Ordinal Position: 20
    Required: False
    Source Field: SOFQuestion_10
    Source Table: SOFInput

SOFQuestion_11   Number (Integer)   2
    AllowZeroLength: False
    Attributes: Fixed Size
    Collating Order: General
    ColumnHidden: False
    ColumnOrder: Default
    ColumnWidth: 1740
    Decimal Places: Auto
    DisplayControl: Text Box
    Ordinal Position: 21
    Required: False
    Source Field: SOFQuestion_11
    Source Table: SOFInput

SOFQuestion_12   Number (Integer)   2
    AllowZeroLength: False
    Attributes: Fixed Size
    Collating Order: General
    ColumnHidden: False
    ColumnOrder: Default
    ColumnWidth: 1650
    Decimal Places: Auto
    DisplayControl: Text Box
    Ordinal Position: 22
    Required: False
    Source Field: SOFQuestion_12
    Source Table: SOFInput

SOFQuestion_13   Number (Integer)   2
    AllowZeroLength: False
    Attributes: Fixed Size
    Collating Order: General
    ColumnHidden: False
    ColumnOrder: Default
    ColumnWidth: 1740
    Decimal Places: Auto
    DisplayControl: Text Box
    Ordinal Position: 23
    Required: False
    Source Field: SOFQuestion_13
    Source Table: SOFInput

SOFQuestion_14   Number (Integer)   2
    AllowZeroLength: False
    Attributes: Fixed Size
    Collating Order: General
    ColumnHidden: False
    ColumnOrder: Default
    ColumnWidth: 1680
    Decimal Places: Auto
    DisplayControl: Text Box
    Ordinal Position: 24
    Required: False
    Source Field: SOFQuestion_14
    Source Table: SOFInput

SOFQuestion_15   Number (Integer)   2
    AllowZeroLength: False
    Attributes: Fixed Size
    Collating Order: General
    ColumnHidden: False
    ColumnOrder: Default
    ColumnWidth: 1725
    Decimal Places: Auto
    DisplayControl: Text Box
    Ordinal Position: 25
    Required: False
    Source Field: SOFQuestion_15
    Source Table: SOFInput

SOFQuestion_16   Number (Integer)   2
    AllowZeroLength: False
    Attributes: Fixed Size
    Collating Order: General
    ColumnHidden: False
    ColumnOrder: Default
    ColumnWidth: 1710
    Decimal Places: Auto
    DisplayControl: Text Box
    Ordinal Position: 26
    Required: False
    Source Field: SOFQuestion_16
    Source Table: SOFInput

SOFQuestion_17   Number (Integer)   2
    AllowZeroLength: False
    Attributes: Fixed Size
    Collating Order: General
    ColumnHidden: False
    ColumnOrder: Default
    ColumnWidth: 1725
    Decimal Places: Auto
    DisplayControl: Text Box
    Ordinal Position: 27
    Required: False
    Source Field: SOFQuestion_17
    Source Table: SOFInput

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SOFQuestion_18   Number (Integer)   2
    AllowZeroLength: False
    Attributes: Fixed Size
    Collating Order: General
    ColumnHidden: False
    ColumnOrder: Default
    ColumnWidth: 1695
    Decimal Places: Auto
    DisplayControl: Text Box
    Ordinal Position: 28
    Required: False
    Source Field: SOFQuestion_18
    Source Table: SOFInput

SOFQuestion_19   Number (Integer)   2
    AllowZeroLength: False
    Attributes: Fixed Size
    Collating Order: General
    ColumnHidden: False
    ColumnOrder: Default
    ColumnWidth: 1650
    Decimal Places: Auto
    DisplayControl: Text Box
    Ordinal Position: 29
    Required: False
    Source Field: SOFQuestion_19
    Source Table: SOFInput

SOFQuestion_20   Number (Integer)   2
    AllowZeroLength: False
    Attributes: Fixed Size
    Collating Order: General
    ColumnHidden: False
    ColumnOrder: Default
    ColumnWidth: 1920
    Decimal Places: Auto
    DisplayControl: Text Box
    Ordinal Position: 30
    Required: False
    Source Field: SOFQuestion_20
    Source Table: SOFInput

SOFcomments   Memo   -
    AllowZeroLength: False
    Attributes: Variable Length
    Collating Order: General
    ColumnHidden: False
    ColumnOrder: Default
    ColumnWidth: 4800
    Ordinal Position: 31
    Required: False
    Source Field: SOFcomments
    Source Table: SOFInput

SOF_ID_FK5   Number (Long)   4
    AllowZeroLength: False
    Attributes: Fixed Size
    Collating Order: General
    ColumnHidden: False
    ColumnOrder: Default
    ColumnWidth: Default
    Decimal Places: Auto
    DisplayControl: Text Box
    Ordinal Position: 32
    Required: False
    Source Field: SOF_ID_FK5
    Source Table: SOFInput

<u>Table Indexes</u>

Name	Number of Fields
_ID	1

Clustered:	False
Distinct Count:	53
Foreign:	False
Ignore Nulls:	False
Name:	_ID
Primary:	True
Required:	True
Unique:	True
Fields:	_ID, Ascending

Name	Number of Fields
Code	1

Clustered:	False
Distinct Count:	6
Foreign:	False
Ignore Nulls:	False
Name:	Code
Primary:	False
Required:	False
Unique:	False
Fields:	Code, Ascending

Table: TeachingAssignment

Columns

Name	Type	Size
Code	Text	50

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	1
Required:	False
Source Field:	Code
Source Table:	TeachingAssignment

Name	Type	Size
_ID	Number (Long)	4

AllowZeroLength:	False
Attributes:	Fixed Size, Auto-Increment
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
Ordinal Position:	2
Required:	False
Source Field:	_ID
Source Table:	TeachingAssignment

Name	Type	Size
Segments	Text	50

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	3
Required:	False
Source Field:	Segments
Source Table:	TeachingAssignment

Name	Type	Size
CourseNumber	Text	6

AllowZeroLength:	False		
Attributes:	Variable Length		
Collating Order:	General		
ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
DisplayControl:	Text Box		
Ordinal Position:	4		
Required:	False		
Source Field:	CourseNumber		
Source Table:	TeachingAssignment		

YearOffered   Number (Long)   4

AllowZeroLength:	False
Attributes:	Fixed Size
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
Decimal Places:	Auto
Default Value:	0
DisplayControl:	Text Box
Ordinal Position:	5
Required:	False
Source Field:	YearOffered
Source Table:	TeachingAssignment

Quarter   Text   10

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	6
Required:	False
Source Field:	Quarter
Source Table:	TeachingAssignment

CreditHours   Text   50

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	7
Required:	False
Source Field:	CreditHours
Source Table:	TeachingAssignment

Enrollment   Text   50

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General

Table: TeachingAssignment

ColumnHidden:	False:
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	8
Required:	False
Source Field:	Enrollment
Source Table:	TeachingAssignment

CoordWith		Text		50
	AllowZeroLength:	False		
	Attributes:	Variable Length		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	DisplayControl:	Text Box		
	Ordinal Position:	9		
	Required:	False		
	Source Field:	CoordWith		
	Source Table:	TeachingAssignment		

Table Indexes

Name		Number of Fields	
_ID		1	
	Clustered:	False	
	Distinct Count:	78	
	Foreign:	False	
	Ignore Nulls:	False	
	Name:	_ID	
	Primary:	False	
	Required:	False	
	Unique:	False	
	Fields:	_ID, Ascending	
PrimaryKey		1	
	Clustered:	False	
	Distinct Count:	78	
	Foreign:	False	
	Ignore Nulls:	False	
	Name:	PrimaryKey	
	Primary:	True	
	Required:	True	
	Unique:	True	
	Fields:	_ID, Ascending	

Table: TextBook

Columns

Name		Type	Size	
Author		Text		50
	AllowZeroLength:	False		
	Attributes:	Variable Length		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	DisplayControl:	Text Box		
	Ordinal Position:	1		
	Required:	False		
	Source Field:	Author		
	Source Table:	TextBook		
Title		Text		75
	AllowZeroLength:	False		
	Attributes:	Variable Length		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	DisplayControl:	Text Box		
	Ordinal Position:	2		
	Required:	False		
	Source Field:	Title		
	Source Table:	TextBook		

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ISBN			Text	50
	AllowZeroLength:	False		
	Attributes:	Variable Length		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	DisplayControl:	Text Box		
	Ordinal Position:	3		
	Required:	False		
	Source Field:	ISBN		
	Source Table:	TextBook		

CODE			Text	50
	AllowZeroLength:	False		
	Attributes:	Variable Length		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	DisplayControl:	Text Box		
	Ordinal Position:	4		
	Required:	False		
	Source Field:	CODE		
	Source Table:	TextBook		

CourseNumber			Text	7
	AllowZeroLength:	False		
	Attributes:	Variable Length		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	DisplayControl:	Text Box		
	Ordinal Position:	6		
	Required:	False		
	Source Field:	CourseNumber		
	Source Table:	TextBook		

Quarter			Text	50
	AllowZeroLength:	False		
	Attributes:	Variable Length		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	DisplayControl:	Text Box		
	Ordinal Position:	7		
	Required:	False		
	Source Field:	Quarter		
	Source Table:	TextBook		

Year			Text	50
	AllowZeroLength:	False		
	Attributes:	Variable Length		
	Collating Order:	General		
	ColumnHidden:	False		
	ColumnOrder:	Default		
	ColumnWidth:	Default		
	DisplayControl:	Text Box		
	Ordinal Position:	8		
	Required:	False		
	Source Field:	Year		
	Source Table:	TextBook		

Edition			Text	5
	AllowZeroLength:	False		
	Attributes:	Variable Length		
	Collating Order:	General		

ColumnHidden:	False		
ColumnOrder:	Default		
ColumnWidth:	Default		
DisplayControl:	Text Box		
Ordinal Position:	9		
Required:	False		
Source Field:	Edition		
Source Table:	TextBook		

YearofBook — Number (Integer) — 2

AllowZeroLength:	False
Attributes:	Fixed Size
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
Decimal Places:	Auto
Default Value:	0
DisplayControl:	Text Box
Ordinal Position:	10
Required:	False
Source Field:	YearofBook
Source Table:	TextBook

Publisher — Text — 50

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	11
Required:	False
Source Field:	Publisher
Source Table:	TextBook

RequiredNum — Number (Integer) — 2

AllowZeroLength:	False
Attributes:	Fixed Size
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
Decimal Places:	Auto
Default Value:	0
DisplayControl:	Text Box
Ordinal Position:	12
Required:	False
Source Field:	RequiredNum
Source Table:	TextBook

AnticipatedEnrollment — Number (Integer) — 2

AllowZeroLength:	False
Attributes:	Fixed Size

Table: TextBook

Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
Decimal Places:	Auto
Default Value:	0
DisplayControl:	Text Box
Ordinal Position:	13
Required:	False
Source Field:	AnticipatedEnrollment

	Source Table:	TextBook	

Segments		Text	3
	AllowZeroLength:	False	
	Attributes:	Variable Length	
	Collating Order:	General	
	ColumnHidden:	False	
	ColumnOrder:	Default	
	ColumnWidth:	Default	
	DisplayControl:	Text Box	
	Ordinal Position:	14	
	Required:	False	
	Source Field:	Segments	
	Source Table:	TextBook	

ID		Number (Long)	4
	AllowZeroLength:	False	
	Attributes:	Fixed Size, Auto-Increment	
	Collating Order:	General	
	ColumnHidden:	False	
	ColumnOrder:	Default	
	ColumnWidth:	Default	
	Ordinal Position:	15	
	Required:	False	
	Source Field:	ID	
	Source Table:	TextBook	

Table Indexes

Name		Number of Fields
CODE		1
	Clustered:	False
	Distinct Count:	9
	Foreign:	False
	Ignore Nulls:	False
	Name:	CODE
	Primary:	False
	Required:	False
	Unique:	False
	Fields:	CODE, Ascending
ID		1
	Clustered:	False
	Distinct Count:	16
	Foreign:	False
	Ignore Nulls:	False
	Name:	ID
	Primary:	False
	Required:	False
	Unique:	True
	Fields:	ID, Ascending
PrimaryKey		1
	Clustered:	False
	Distinct Count:	16
	Foreign:	False
	Ignore Nulls:	False
	Name:	PrimaryKey
	Primary:	True
	Required:	True
	Unique:	True
	Fields:	ID, Ascending
RequiredNum		1
	Clustered:	False
	Distinct Count:	14
	Foreign:	False
	Ignore Nulls:	False
	Name:	RequiredNum
	Primary:	False
	Required:	False

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Unique:	False	
Fields:	RequiredNum, Ascending	

Table: ThesisFacAssessment

Columns

Name	Type	Size
FacName	Text	50

AllowZeroLength:	False	
Attributes:	Variable Length	
Collating Order:	General	
ColumnHidden:	False	
ColumnOrder:	Default	
ColumnWidth:	Default	
DisplayControl:	Text Box	
Ordinal Position:	1	
Required:	False	
Source Field:	FacName	
Source Table:	ThesisFacAssessment	

Role	Text	50

AllowZeroLength:	False	
Attributes:	Variable Length	
Collating Order:	General	
ColumnHidden:	False	
ColumnOrder:	Default	
ColumnWidth:	Default	
DisplayControl:	Text Box	
Ordinal Position:	2	
Required:	False	
Source Field:	Role	
Source Table:	ThesisFacAssessment	

Curric	Text	50

AllowZeroLength:	False	
Attributes:	Variable Length	
Collating Order:	General	
ColumnHidden:	False	
ColumnOrder:	Default	
ColumnWidth:	Default	
DisplayControl:	Text Box	
Ordinal Position:	3	
Required:	False	
Source Field:	Curric	
Source Table:	ThesisFacAssessment	

OtherCurric	Text	50

AllowZeroLength:	False	
Attributes:	Variable Length	
Collating Order:	General	
ColumnHidden:	False	
ColumnOrder:	Default	
ColumnWidth:	Default	
DisplayControl:	Text Box	
Ordinal Position:	4	
Required:	False	
Source Field:	OtherCurric	
Source Table:	ThesisFacAssessment	

Service	Text	50

AllowZeroLength:	False	
Attributes:	Variable Length	
Collating Order:	General	
ColumnHidden:	False	
ColumnOrder:	Default	
ColumnWidth:	Default	
DisplayControl:	Text Box	

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Ordinal Position:	5		
Required:	False		
Source Field:	Service		
Source Table:	ThesisFacAssessment		

GradDate   Text   50

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	6
Required:	False
Source Field:	GradDate
Source Table:	ThesisFacAssessment

Question1   Text   50

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	7
Required:	False
Source Field:	Question1
Source Table:	ThesisFacAssessment

Question2   Text   50

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	8
Required:	False
Source Field:	Question2
Source Table:	ThesisFacAssessment

Question3   Text   50

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	9
Required:	False
Source Field:	Question3
Source Table:	ThesisFacAssessment

Question4   Text   50

AllowZeroLength:	False
Attributes:	Variable Length
Collating Order:	General
ColumnHidden:	False
ColumnOrder:	Default
ColumnWidth:	Default
DisplayControl:	Text Box
Ordinal Position:	10
Required:	False
Source Field:	Question4
Source Table:	ThesisFacAssessment

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Question5   Text   50
        AllowZeroLength: False
        Attributes: Variable Length
        Collating Order: General
        ColumnHidden: False
        ColumnOrder: Default
        ColumnWidth: Default
        DisplayControl: Text Box
        Ordinal Position: 11
        Required: False
        Source Field: Question5
        Source Table: ThesisFacAssessment

Question6   Text   50
        AllowZeroLength: False
        Attributes: Variable Length
        Collating Order: General
        ColumnHidden: False
        ColumnOrder: Default
        ColumnWidth: Default
        DisplayControl: Text Box
        Ordinal Position: 12
        Required: False
        Source Field: Question6
        Source Table: ThesisFacAssessment·

Question7   Text   50
        AllowZeroLength: False
        Attributes: Variable Length
        Collating Order: General
        ColumnHidden: False
        ColumnOrder: Default
        ColumnWidth: Default
        DisplayControl: Text Box
        Ordinal Position: 13
        Required: False
        Source Field: Question7
        Source Table: ThesisFacAssessment

Question8   Text   50
        AllowZeroLength: False
        Attributes: Variable Length
        Collating Order: General
        ColumnHidden: False
        ColumnOrder: Default
        ColumnWidth: Default
        DisplayControl: Text Box
        Ordinal Position: 14
        Required: False
        Source Field: Question8
        Source Table: ThesisFacAssessment

Question9   Text   50
        AllowZeroLength: False
        Attributes: Variable Length
        Collating Order: General
        ColumnHidden: False
        ColumnOrder: Default
        ColumnWidth: Default
        DisplayControl: Text Box
        Ordinal Position: 15
        Required: False
        Source Field: Question9
        Source Table: ThesisFacAssessment

Question10   Text   50
        AllowZeroLength: False
        Attributes: Variable Length
        Collating Order: General

```
                    ColumnHidden:         False
                    ColumnOrder:          Default
                    ColumnWidth:          Default
                    DisplayControl:       Text Box
                    Ordinal Position:     16
                    Required:             False
                    Source Field:         Question10
                    Source Table:         ThesisFacAssessment

Question11                                Text                        50
                    AllowZeroLength:      False
                    Attributes:           Variable Length
                    Collating Order:      General
                    ColumnHidden:         False
                    ColumnOrder:          Default
                    ColumnWidth:          Default
                    DisplayControl:       Text Box
                    Ordinal Position:     17
                    Required:             False
                    Source Field:         Question11
                    Source Table:         ThesisFacAssessment

Date                                      Text                        50
                    AllowZeroLength:      False
                    Attributes:           Variable Length
                    Collating Order:      General
                    ColumnHidden:         False
                    ColumnOrder:          Default
                    ColumnWidth:          Default
                    DisplayControl:       Text Box
                    Ordinal Position:     18
                    Required:             False
                    Source Field:         Date
                    Source Table:         ThesisFacAssessment

_ID                                       Number (Long)               4
                    AllowZeroLength:      False
                    Attributes:           Fixed Size, Auto-Increment
                    Collating Order:      General
                    ColumnHidden:         False
                    ColumnOrder:          Default
                    ColumnWidth:          Default
                    Ordinal Position:     19
                    Required:             False
                    Source Field:         _ID
                    Source Table:         ThesisFacAssessment
```

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Table Indexes

Name	Number of Fields
_ID	1

        Clustered: False
        Distinct Count: 2
        Foreign: False
        Ignore Nulls: False
        Name: _ID
        Primary: False
        Required: False
        Unique: False
        Fields: _ID, Ascending

PrimaryKey	1

        Clustered: False
        Distinct Count: 2
        Foreign: False
        Ignore Nulls: False
        Name: PrimaryKey
        Primary: True
        Required: True
        Unique: True
        Fields: _ID, Ascending

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